UNIVERSITY MEDICAL SCHOOLS
with special reference to the design of teaching and reseach laboratories

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TEXT BOUND CLOSE TO THE SPINE IN THE ORIGINAL THESIS

ABSTRACT

There is a lack of information in Great Britain on the planning and on the design of university medical schools. In the absence of established criteria, medical school planners are required to set about a tedious compilation of requisite information by an empirical rather than a methodical process. It is realized that this process is unavoidable at the outset of medical school planning, but it is felt that it could be simplified by more standardized procedural methods.

In the first two chapters, an attempt is made to provide a brief chronoligical survey of events in medical education up to the present time, laying emphasis on the historical associations of British medical schools and how traditions have come to influence present attitudes. An attempt is also made to examine future trends in medical education as they are likely to influence the design of medical schools.

In the initial stages of any medical school design, it is considered essential to establish a broad framework along which the design may develop. Such a framework will need to encompass a variety of factors, but the foremost of these concerns medical school objectives and their evaluation, and the general pattern that planning is to follow in the attainment of these objectives. To this end, and on the basis of some recent planning efforts, a number of medical schools' patterns of accommodation are provided in Chapter 3 which, it is hoped, may serve as a guide to medical school planners.

The final chapter is a study of practical applications on medical school design which are considered to embody some of the criteria established in the former chapters, with special reference to possible developments in medical student teaching.

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HISTORICAL INTRODUCTION 1.

THE ANCIENT CIVILIZATIONS

Ancient civilizations of Egypt, Babylonia, Mexico and Peru, all record acts of humanitarian kindness, however it is true to say that medicine as practised in these times was more by way of superstition and fear than any true understanding of the scientific principles involved. Medical care was in the hands of clergy/ physicians who for many centuries maintained a favoured position is society by fostering ignorance and practising their craft, using a satisfactory combination of scholarship and religion, observation and hereditary knowledge. Abraham Flexner was led to observe that early medicine was "...a curious blend of superstition, empiricism, and that kind of sagacious observation which is the stuff out of which ultimately science is made."(1)

For evidence of early systematic science in medicine, it is understandable that we must turn to the universities. During the Indian Post-Vedic period (600 B.C. - 200 A.D.) the Taxila and Nalanda Universities offered the medical degree of Prana Acharya and Prana Visharada, and medical ethics were of a high order. A "Medical Oath" governed the behaviour of medical students in respect of their teachers, and obligations to patients of both sexes. Personal hygiene too was advocated and rules laid down for the prevention of contamination and cross infection. Under Rahula Sankrityayana (son of Buddha), a hospital system was instituted in such places as Nalanda and Ceylon, where remains are still being discovered; laws were also instituted governing the illegal practice of quack practitioners (Kuvaidyas).

1. Flexner A. Medical Education. Part 1, p.p. 1.

It is unfortunate that medical education in India stagnated after this time, and that the ancient universities vanished.

The story of earliest medical education is generally one of personalities, of men such as Charaka a Hindu, who set out in 500 B.C. to show the ideals to be followed by medical students in obtaining a sound medical education, and Hippocrates who, in the oath attributed to him, exemplified the student/ teacher relationship and defined the difference between precept and practical instruction.

Thanks to the Greek preoccupation with method as the basis of all their procedures, we are fortunate in retaining several fine examples of recorded medicine - although it may be assumed that a greater number have been destroyed. From these records, it is evident that Greek physicians gained their medical education through experience rather than by any systematized instruction. Medical students became apprenticed to physicians for a number of years, although the more fortunate were trained by physician-fathers.

The Roman era witnessed an extension of Greek medical learning and the scientific approach, culminating in the establishment of schools for formal learning. Medical education became standardized throughout the Roman world, and took the form of demonstrations by teachers on humans and animals. In later years there came a gradual separation of theory and practice,and education came to rely more on the written word; nevertheless, the apprenticeship system introduced by the Greeks was also accepted by the Romans and flourished there.

9th CENTURY

The profound influence that Italy was to have on medicine, probably originated with the foundation of a medical school in Salerno in the 9th century. It is said to have been the first to admit female students. There were formal lectures and demonstrations, with surgery and anatomy the principal subjects. Unfortunately little trace remains of this school, although its contribution to medicine and its influence were wide-spread.

THE MIDDLE AGES

By the 12th century, the effects of the Salerno school were becoming apparent all over Europe. Physicians trained in this Italian school were responsible for founding institutions in France, Spain, Portugal, and England. There seems to have been little distinction between religion, medicine and learning generally, and as a consequence, the church still exerted a powerful influence over medicine and teaching.

Many ancient universities, which are still important centres of learning, were founded in this period; some of the more prominent of these were, Paris 1110, Bologna 1113, Oxford 1167, Padua 1222, and Montpellier in the early 12th century, although several historians have put it earlier than this. The medical school at Montpellier made several outstanding contributions in the period, including the introduction of medical botany to a growing list of medical technologies, which resulted in many publications on the subject. The school also produced notable personalities such as Arnold of Villanova who was a prolific writer of the Middle Ages, Henri de Mondeville, and

Guy de Chauliac, whose treatise on surgery was an influential force for good even up to the 17th century.

England during the Middle Ages was no less dominated by the church than the rest of Europe. Two clergy/ physicians were arousing new interest in the scientific approach to medicine - Albert Magnus by his interpretations of Aristotle's teachings, and Roger Bacon, who, more in the vogue of the 20th century, emphasized the importance of original research as a necessary means to the acquisition of knowledge.

The sick were cared for in institutions erected by the monasteries, and those suffering from infectious diseases, especially leprosy, were accommodated in lazar houses. St. Bartholomew's, London, was one such monastic institution founded in 1123 by Rahere the monk. St. Bartholomew's, Rochester, a leper hospital founded in 1078, is the oldest British hospital still operating.

14th & 15th CENTURIES

The 15th century, and the Italian Renaissance in art and architecture, witnessed a comparable era of development in medicine and science; it was an era in which Italian schools made their outstanding contribution to medical education, and in particular the schools at Bologna, Pisa, and Ferrara. Padua during the 14th and 15th centuries became the fountainhead of learning for students of Oxford and Cambridge; so much so, and in such numbers, that in 1421, the English universities deemed it necessary to petition

FIGURE 1a: Bartholomaeus Anglicus (de Glanvilla - c. 1360) Earliest record, a woodcut, of an autopsy and a Professor of medicine lecturing to students. Source: D. Riesman; The Story of Medicine in the Middle Ages; New York, Hoeber, 1935, p.p. 179.

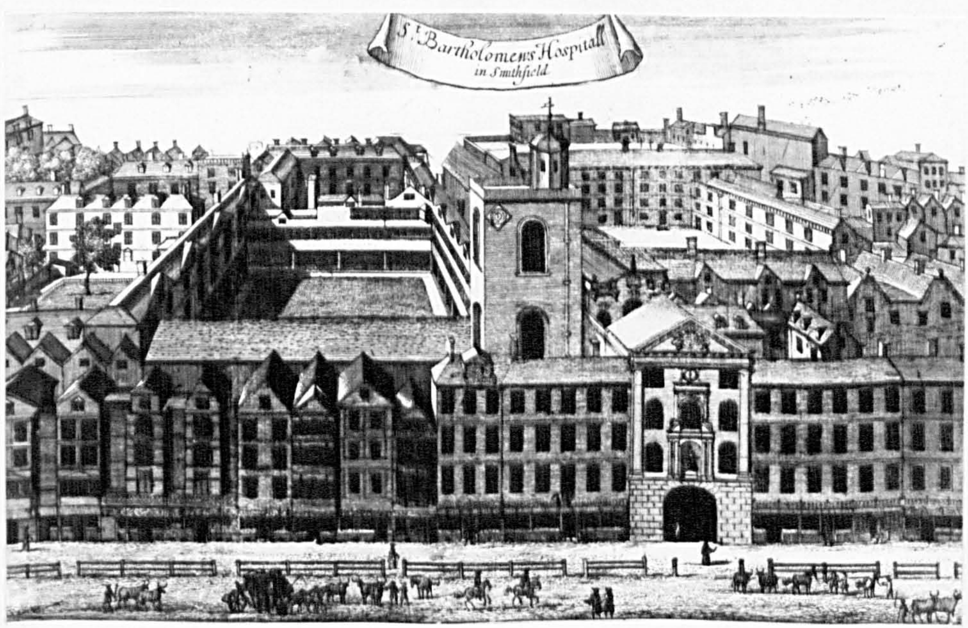

FIGURE 1b: St.Bartholomew's Hospital 1720.
Source: Original engraving in the Wellcome Historical Medical Museum.

parliament. As a result of this petition, it was seen fit to pass a decree which stipulated that students must become qualified with an M.D. either from Oxford or Cambridge before they could become eligible to practise in this country.

Catholic/ Protestant religious disputes tended to curtail this activity to some extent in the late 16th and early 17th centuries, and English students became more inclined to frequent the safer Protestant universities in Sweden, Switzerland,Holland, and especially the school at Leyden (see Fig. 2).

16th CENTURY

Medical education was undoubtedly advanced in the 16th century by the adoption of the system of licensure in England. Thomas Linacre, a product of the Italian school, returned to England and founded the Royal College of Physicians under charter from Henry V111. Stimulated by his training, he established two medical lectureships at Oxford and one at Cambridge, two of which later became the Regius Chairs of Medicine at Oxford and Cambridge. The second of the Oxford lectureships still survives. Caius College of Medicine at Cambridge still bears the name of Linacre's contemporary, John Caius, who was similarly influenced in Padua by Vesalius, Professor of Anatomy. He endowed two fellowships for medicine and twenty scholarships.

Leprosy had begun to recede in the 15th century, rendering obsolete the majority of lazar houses,and after the dissolution of the monasteries between 1530 and 1540, hospitals in England became almost defunct except in a few instances such as St. Bartholomews, St.Thomas's, and three other "Royal Hospitals". These hospitals were placed under the care of the City Corporation, but there were no new hospitals of any consequence for 200 years after the Reformation.

17th CENTURY

The Italian influence on the scholarship and learning of the previous century, extended to a revitalized quest for knowledge through experimentation in the 17th century. It was reflected in a new wave of scientific and medical discovery by men such as the Englishman Harvey who became Professor of Anatomy at Padua. His discovery of the circulatory system of the blood has probably had more influence on the modern school of physiology than any other, and it was not until the foundation of European scientific academies and institutes later in the century that its magnitude was fully realised.

Lock and Sydenham also added their contributions to medical education in this century; one in theory, and the other in practice. They showed that in addition to a normal university outlook, the student must be trained to observe, practise and to realize the limits of medicine.

FIGURE 2a: Regnerus de Graff (1641 - 1673). A doctor lecturing to students in a sick room with a patient in bed. A cadaver lies on the long table. Source: Tractatus anatomico-medicus de succi pancreatici natura & usu. Leyden; ex. off Hackiana, 1671.

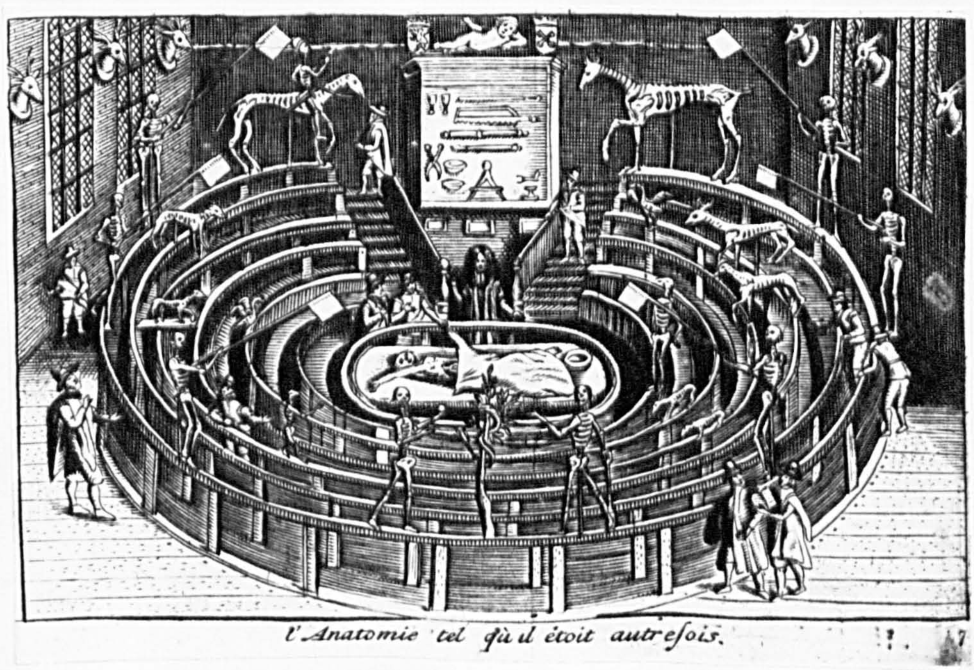

FIGURE 2b: Leyden Anatomical Theatre, 1712. Source: P. Vander Aa. Les Delices de Leide ... Leyden; P. Vander Aa. 1712, p.p. 83.

18th CENTURY

Anatomy Schools:

London, Edinburgh, Aberdeen,and Dublin were the only centres for comprehensive medical education in England at the beginning of the 18th century. Most schools provided sound clinical instruction, but preclinical teaching, and anatomy in particular, were sadly neglected. There were 7 medical schools in London, but only 2 of these (Guy's and St.Thomas's) offered a complete and formal course.

The natural outcome of this deficiency was the establishment in London of extra-mural or "anatomy" schools run for profit; they were to be closely followed by similar schools in the Provinces. Although admissions were not restricted, the anatomy schools were most commonly frequented by medical students. With success highly dependent on financial turnover,and well-being governed by numbers filling the rolls, it is no unnatural that student-interests were frequently subjugated to jealous rivalry between schools. Fierce competition often resulted in untimely closures, one such being an anatomy school opened by a Mr. Overend in 1828 which soon failed in competition with the "Medical Institution", later to become the Sheffield Medical School.

Not all anatomy schools were infamous, and in some cases standards were exceptionally high, for example, schools such as the Windmill Street School run by William and John Hunter in association with Hewson, Cruikshank, Bailie and Wilson, Skeys in Aldersgate, and Edward Graingers' over a tailor's shop in Webb Street at the back of Guy's Hospital.

The Royal College of Physicians was apparently loath to be enmeshed in the affairs of medical or anatomy schools, especially in such matters as finance, for in 1811 it gave flattering recognition to the "noble hospitals" which "abounded" in London, and to the worthwhile services rendered to medical teaching by the anatomy schools. In spite of these glowing tributes, medical education was haphazard to say the least, and general ignorance of even the simplest of medical procedures, on the part of an uninformed public, fostered a parasitic army of quacks. They benefited the population little and contributed to a dubious reputation later in the century, which the profession can hardly refute.

At this time, medical education was based on an apprenticeship system which could be carried out in one of three ways:

1. 5 year identureship to an apothecary or general practitioner, followed by the examination of the Society of Apothecaries.
2. Surgeon apprenticeship, or as surgeons' "mates" in the army, with examination by the Corporation of Surgeons.
3. Aspiring physicians were required to undergo a much longer period of study. It commenced with a short apprenticeship to a physician, followed by a period of university study for a degree in the arts, and finally, a written thesis for the medical degree. Before 1812, hospital apprenticeship was not considered so important as acquiring an arts degree.

A conception of his profession, which no doubt would have found favour with the 18th century physician, was, that of a gentleman of the better middle class (although it was not always so) who was distinguished, scholarly, who "advised rather than did"[(1)], and who was a man of culture (rather than possessed of a sound knowledge of medicine). In public esteem too, the physician fared much better than his medical contemporaries - the apothecary tended to be looked down upon for his less cultured Provincial associations, and the surgeon was finding it difficult to wipe off the stigma of a "barbershop" heritage.

The Industrial Revolution and the Rise of the Voluntary Hospital:

The 18th century witnessed a revolution in British industry. It had the effect of rapidly transforming the country from a state of semi-feudalism and mild prosperity to that of a roaring industrial giant, voraciously devouring huge tracts of land, and by way of recompense, producing slums, overcrowding, inadequate sanitation, with subsequent increases in sickness and disease. Regrettably, many of these travesties are still with us.

Until this time, care of the sick had been administered under the Poor Laws, the implementation of which passed into the hands of the State following the Poor Law Statute under Elizabeth 1. An industrial revolution and the inability of the government to cope with the vast numbers of infirm, brought growing discontent: at the same time John Wesley was preaching salvation through works of charity. Consequent upon these two factors, a number of hospitals were begun by volunteers from charitable institutions. Thus founded, the voluntary

1. Newman C. The Evolution of Medical Education in the nineteenth century. p.p. 1.

hospitals functioned almost unchanged until World War 2, and through the early system of staff organisation, medical teaching became almost a prerogative of these institutions, although not all voluntary hospitals were devoted to teaching.

Voluntary hospitals were always poor, and almost immediately after their inception the system of medical apprenticeships extended to the wards, for two reasons:(1) Students represented an excellent source of cheap labour, which, although lacking experience, was eminently suited to the menial work of the wards: (2) A practice began in St.Thomas's 1751, whereby staff were permitted to accept fees from students in return for clinical instruction - other voluntary hospitals were quick to see the financial advantages of the arrangement.

Regrettably, and despite the sincerity of early intentions, the success of ward teaching depended on the private embursement of staff; the system lacked unified control, and in the main it accounted for a gradual degeneration of medical education standards and ethics until the middle of the following century. Notwithstanding, ward instruction was a forward step in medical education, and in it we see the foundations of modern clinical teaching.

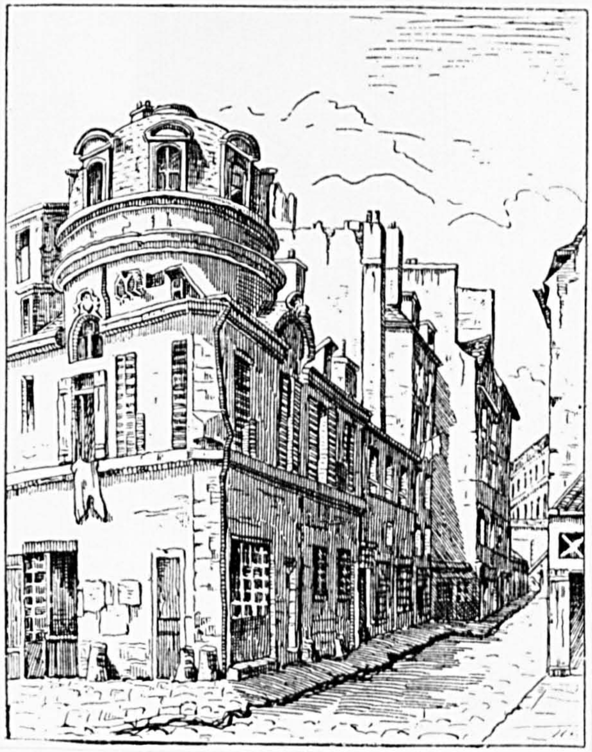

FIGURE 3a: The Old Faculty of Medicine in the Rue de la Bucherie, Paris,1469-1792. Sourcé: David Riesman; The Story of Medicine in the Middle Ages; New York; Hoeber, 1935, p.p.148.

FIGURE 3b: Brooke's Anatomy School, London, 1895.
Source: British Medical Journal, 1895, Vol. 1, p.p.1452.

19th CENTURY

By the beginning of the 19th century technological advances and the scientific approach were responsible for a greater emphasis on accepted knowledge in preference to personal experience combined with experiment. In France, schools under Coruisart, Laennec and Louis were representative of "modern" ideals in medical teaching, and students from all parts of Europe and America began to gravitate to these centres.

Teaching hospitals too were changing. Despite their many faults, the anatomy schools were being"adopted" by the teaching hospitals, and the schools of medicine incorporated with the hospitals. Commercialism persisted, and hospital medical schools were operated on a private enterprise basis by staff who expected returns on investments. That these schools were self-sufficient, and that an anomalous situation was permitted to exist as long as it did, is again evidence of the desire of medical authorities to disassociate themselves with financial matters, and with the organisation necessary for an ordered and efficient medical education system.

There existed no regular system of staff appointments, and the calibre of the staff which found its way into a teaching hospital can only be left to conjecture. The measure of teaching achievement was tempered by its financial returns, and in some instances lecturers even nominated their own successors. Rivalry between teachers was always intense, frequently bitter, and students can hardly have benefited from the bickerings between their seniors.

Troubles between the student groups were no less evident. It was partly attributable to a commonly held belief that regular hospital promotion could only be attained by frequent and substantial payments through the right channels; dubious, but not inconceivable in the light of an examination system governed by an attitude of "degrees for cash", in which even the examiners, with little self recrimination, competitively advertised easy examinations for small fees.

In an educational system such as it was, students were of 3 types:

1. The wealthy student aristocracy, apprenticed to, and who recognised none but their individual masters.
2. "Dressers", who could not afford to pay for instruction, and who constituted a cheap form of ward labour in return for experience and casual teaching.
3. "Clerks", who were able to meet the cost of lecturers' fees in the medical school.

Students were largely self taught, and for the most part were left to rely upon their own initiative. In one instance at St.Bartholomews, lacking an adequate reading room, they formed a student club which occupied a small room over a bakery.

By the middle of the 19th century parliament had come to realise that all was not well with British medical education, and a growing cry for reform was eventually acknowledged. Under the Medical Act of 1858, the General Medical Council was formed with the following aims: (1) Supervision and regulation of standards of professional knowledge expected of medical students before qualification; (2) Registration of qualified medical men; (3) To publish British pharmacopoeia.

Some years later (1867), a medical school curriculum was laid down by the Council. In 1869 the order of subjects was decided by the Medical Education Committee and they became a necessary prerequisite of admission to the Medical Register. The result was an almost immediate closure of the majority of small medical schools, and those which did survive came under the control of committees of Boards of Governors of the larger teaching hospitals.

Medicine also. was being slowly but surely transformed; at the beginning of the 19th century, the prevailing concept of medicine was still that of an art of mystery and intuition. During the century, this was supplanted by technology and scientific diagnosis based on the safe findings of a minority few who were undertaking the responsibility of exploratory investigation.

The University Influence:

In the pursuit of their clinical endeavours, educators in England overlooked a further deficiency in the medical teaching system - this was the need for a medical school to be identified with the activities of a university. There were only 4 university medical schools in England - Oxford and Cambridge (both somewhat remote from hospitals and dependent to an extent on London), Durham and London. The remaining medical schools in the country were separated from the university influence and remained in close association with their parent hospitals. Lacking any real guidance, it is surprising that most of these schools did eventually find their way into the university fold, although the situation was not completely rectified until after the Second World War.

Diversified as they were, and in spite of outstanding individual contributions to medical science, this lack of coordination was reflected in a gradual decline of the English medical school influence in the latter part of the century. Even today, many medical teachers do not recognize the dangers of insularity on the part of the medical profession, which, just as any other can only be truly comprehensive in association with others.

The German Scientific Contribution:

Germany presented a more unified university/ medical school front and fared much better. Nearly all German medical schools were located in capital cities, close to universities with their respective teaching hospitals, and the advantages were immediately evident in the rapid rise of distinctive medical teaching, study, and research.

At the beginning of the 19th century France had been undisputed medical leader, but the country declined as an influential force after 1870. When Germany took over the role - especially in laboratory medicine- the country's reputed fastidious attention to detail was never more apparent. For example, in the work of Aschoff on clinical diagnosis, Teutonic thoroughness was responsible for an outstanding advance in patient care. French diagnostic analysis and subsequent confirmation or otherwise by appropriate physical signs, was superceded by a German method of diagnosis in which systematic examination was made of all possible aspects of a patient's history. Much of this work was dependent on the laboratory, from whence, undoubtedly, came its clinical inspiration.

Laboratories in turn may attribute their influence to nationwide German university reform in the first half of the century. This influence was widespread, remaining so until as late as the 1930's. Greece, Turkey, and Japan, were completely indoctrinated by German methods. Modern American teaching and medical schools have largely been modelled on the pattern of the Johns Hopkins Medical School, Baltimore (1893), where German scientific ideals were introduced at the end of the century by the Englishman William Welch who had studied in Germany under Conheim. The new German approach came indirectly to England via the agency of Sir William Osler, who at Johns Hopkins, became convinced of the potential that it afforded. At Oxford, it was Osler's desire to build up a German clinic in preference to the traditional English pattern; his ideal being that the "hospital unit"was as important to medical teaching as the laboratory was to scientific instruction. Osler brought these ideals to the notice of the Haldane Commission; effectively too, for it was Lord Haldane who presided over the Royal Commission in 1910-13, and who was responsible in the 1920's for the introduction of the professorial system and other German medical teaching methods into England.

In Great Britain, it is to Scotland that we must turn for an example of the wider appreciation of the benefits of a university/ medical school affiliation. Scotland possessed only four universities, but these were sufficient for the needs of a small population. Situated in the cities, the universities were conveniently placed for communication with the main hospitals and medical schools. Although not matching the influence of the German schools, Scottish medical schools did further the scientific-medical cause.

20th CENTURY

By 1900, the pattern of English medicine had been established- "…. a system of diagnosis based mainly on the elucidation of physical signs"(1). English medical schools were producing "basic doctors" and generally it was a time of reflection for the General Medical Council. In the light of earlier endeavours, a feeling of satisfied accomplishment prevailed.

In this somewh.t complacent atmosphere Sir Thomas Lewis introduced the first whole time academic unit at University College, London, in 1915. Science had expanded to a point where part-time staff were unable to keep abreast of technologies, and the new role freed them from pressing responsibilities of private practice by allowing them to give their undivided attention to research and teaching on the ward.

Medical education remained uneventful until the Second World War, and the period witnessed a consolidation of the idea of the "safe general practitioner"(2). The medical curriculum did change, however, and by 1939 it had amassed an extaordinary number and variety of subjects, many of which were uncoordinated and merely represented academic hurdles over which the student must climb before the "proper" work of medicine really began. There was also a surprising unawareness of the danger of over specialization at too early an age, and it resulted in a steady decline in the standard of general education and of literature in particular.

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1. Newman C. The Evolution of Medical Education in the nineteenth century. p.p. 309.
2. Recommendations as to the Medical Curriculum. p.p. 13, para.2 .

A Problem of Outdated Hospital Buildings:

In the first quarter of this century, British hospitals were of 3 types - voluntary, poor-law, and local authority. After the 1929 Act, poor-law and local authority hospitals came under municipal control. Voluntary hospitals continued unchanged and came to rely for their existence on legacies, donations, and a system of weekly contributions by its members in return for free hospital treatment when this became necessary. The contributory system was adopted later by municipal hospitals. The glamour of the teaching hospital attracted much the larger share of legacies which in some instances were considerable.

Although medical teaching in London and the Provinces was mainly dependent on the voluntary hospitals, the majority of the London medical schools were linked in some way with municipal hospitals; there were,for instance, no voluntary hospitals for fevers or mental diseases, and instruction was given in municipal hospitals such as the Maudsley Hospital for Infectious Diseases.

World War 2 necessitated an amalgamation of voluntary and municipal hospital staffs to meet the emergency. London and the Home Counties were divided into 12 zones, with each zone under the charge of two regional officers, one from the teaching hospitals and the other from the municipal hospitals. Wartime regional zoning of hospitals organised on a national basis had pointed the way to a similar system which might be put into operation in peace time. The idea materialized with the National Health Service Act of 1946, following a surprise election reversal in 1945 and the coming to power of a socialist governemt under Aneurin Bevan.

Even during the war years, problems of outdated hospital buildings and post-war hospital redevelopment had begun to be faced. By 1945, a voluminous Hospital Survey had been produced outlining some of the inadequacies of the hospitals at that time. Many institutions were in need of reconstruction and modernisation; others by their historical origins were badly located.

The hospital situation became acute after the War. Some of the bomb-damaged institutions were unable to carry out even temporary improvements because of other priorities, shortages of building materials, and building maintenance which lagged ten years behind. Many of the voluntary hospitals were unable to meet their commitments and were only able to remain open by Ministry of Health subsidies; further, the knowledge that hospitals were to be nationalized removed any incentive on the part of either voluntary or municipal hospitals to carry out large scale rebuilding or modernisation. The Emergency Medical Service Hospitals erected between 1940 and 1943 did help to alleviate some of the shortage in the immediate post-war years, but unfortunately, they were only temporary, built to meet the needs of wartime. They were the only hospitals put up in the wartime period. Even before the War, however, new building activity had been extremely rare, and those hospitals erected to serve a community some 100 years or so previously were scarcely adequate for medical science and technology of the mid-20th century.

While teaching hospital and university building stagnated, student expansion had not; too many students for too few places brought overcrowding and the eventual rationing of admissions by competitive examinations. Staff, also, were grossly underpaid, insufficient in number, and scarcely able to devote time to teaching, let alone research. The natural outcome of these deficiencies was a didactic approach regulated by examinations. It allowed for little individual tuition, although Oxford, Cambridge,and University College, London, were exceptions.

SUMMARY

Early medicine was empirical, practised by clergy/ physicians and quacks in an atmosphere of mystery and superstition. The attitude persisted until the 19th century, when science and technology began to assert a more profound influence.

Italy was an outstanding early contributor to medicine and medical education, largely due to the Salerno school.

Germany in the 19th century was mainly responsible for the present ideals of a university/ medical school affiliation, and systematic scientific analysis in the laboratory.

Teaching and research have always been closely aligned. In British medicine, an important outlet for this affinity has been the teaching hospital. Patient care and research achievements in British teaching hospitals established the country as a leading medical centre.

British medical education is strongly influenced by its traditions. It has evolved in two stages:

(1) Pre 1858: There are two features of this early period which bear with some significance on the present time; firstly, the system of clinical apprenticeships which still forms the basis of clinical instruction, and, secondly, the early deficiency of science

Summary (contd.)

in the apprenticeship system - this had to be obtained in the proprietory or anatomy schools. The teaching hospital/ anatomy school dichotomy still finds a physical parallel in many British medical schools - students receive their Preclinical instruction at one institution (now the university), and their "Clinical" training in another (the teaching hospital).

(2) 1858 to World War 2: The period was notable as one of consolidation of measures taken by the government to rectify inadequacies in medical education around the middle of the 19th century. It resulted in stagnation and decline.

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POST–WAR EVENTS 2.

PART 1: DOCUMENTARY REPORTS

The government has the ultimate responsibility for medical schools in this country, although its actual participation in the affairs of medical schools between 1858 and the second world war was minor, save for occasional proclamations in the medical acts, and statutory enforcements when necessary. In the post-war era, in what might be called the third, and indeed the most radical period of development in medical education so far, the government and the General Medical Council have played a more active part by way of reports and curricula recommendations, which have acted as the norm of control. This chapter will be devoted to a closer examination of some of these documents in as much as they have contributed to the present education scene, and as they are likely to influence it in the future.

THE GOODENOUGH REPORT (1)

Thoughts on a National Health Service had been mooted during the war; these, combined with a growing discontent at the present state of medical education (and more expecially as it was before the war), led to the appointment of a committee under Sir William Goodenough, to survey pre-war medical education, and to make recommendations based on its findings which might serve as a guide to educators and medical schools in the formulative years of Britain's peacetime readjustment.

As the subsequent report revealed, there was little that the Committee had found satisfactory in the medical education system. Its investigations were widespread, and its findings were lengthy.

1. Report of the Inter-Departmental Committee on Medical Schools,1944. Chairman - Sir William Goodenough.

The recommendations were aimed at removing the inadequacies and anomalies which had crept in, multiplied, and continued almost without censure since the first G.M.C. regulations were introduced in the middle of the 19th century.

Schools:

The Committee recommended that all medical schools should be university medical schools. At that time, four of the 34 medical schools operating were non-university ("extra-mural"). In addition to university integration, Goodenough advocated an ideal medical school/teaching hospital relationship - that of sharing the same site and including the various specialist clinics. Group teaching hospitals, too, should form a closely knit group, be few in number, and should have one parent hospital for the group. It was considered most important that schools should be autonomous in regard to the organization of medical courses, and in the instruction of their students.

Pre-war Britain showed an unfavourable concentration of medical schools in Edinburgh, Glasgow, and London. These cities accounted for half of the total for the country. In contrast, there was a marked deficiency in East Anglia and South West England. Scotland, with a small population, supported a student population equal to that of England and Wales combined. In addition to the closure of the three non-university medical schools in Scotland, Goodenough recommended a decrease in the student entry rate of the medical schools at Aberdeen, Edinburgh, and Glasgow. For the Provinces and Wales - if staffing could be built up and adequate accommodation and equipment obtained - the schools would be capable of student expansions to admission figures of 80 to 100 per annum, without a necessary falling off in standards. The London schools presented a special problem. Charing Cross and St.George's hospitals should be moved - Charing Cross to a site in Middlesex,and St.George's to a site in the south of London to satisfy a shortage of hospital accommodation in the area. In view of the close proximity of University College, Middlesex, the Royal Free, and 19 other hospitals, some form of decentralization should be considered. The Committee suggested that the London School of medicine for Women and the Royal Free Hospital could be moved. After the resiting of these hospitals, the remaining schools in central London should aim for a student admission rate of 80 to 100 each year.

Staff:

Until 1944, most clinical teachers were engaged on private practice, and taught part-time at the voluntary hospitals - in most cased unpaid. There were very few university clinical professors, and the overall organization of teaching and research was uncoordinated in the medical schools which were still regarded more as incidental teaching hospital appendages, than, as fundamental institutions for fostering these vital requisites. Goodenough recommended the present and future necessity of full-time chairs, at revised salary scales, in order to make professors independent of a necessity to supplement their incomes with outside remuneration; the recommendation was also extended to cover full-time readers, lecturers, and junior staff, allowing sufficient of their time for reading and research. Additional provision should be made to enable qualified practitioners (especially general practitioners) to keep in touch with current developments.

The Committee set down the three important functions of a medical school in relation to medical research: (1) to discover and train future research workers, (2) to encourage and facilitate original investigations by members of their staffs, and (3) to house special research units and research workers.

Undergraduate Students:

Goodenough did not feel that there was likely to be a demand for an increase in the medical student population of Great Britain, except, as mentioned previously, to build up the student intakes in the existing medical schools; consequently, there was no immediate need to build new medical schools. The future maximum annual intake for most medical schools was likely to be around 100 to the clinical part of the course. These students should have access to 950 to 1,000 beds, made up of - general medicine 250, general surgery 250, maternity (including 25 antenatal) 100, gynaecological 50, children's 100, special departments 150 - 200, beds for special purposes 50. Goodenough disagreed with a policy in some schools which restricted admissions by sex; all medical schools should be co-educational, and student places should be competitive. It suggested an approximate male/ female student ratio of 5 : 1. The Committee also considered that the ratio of students to clinical teachers at the bedside had been too great, and instrumental in some cases in a decline of teaching standards; the ratio should be limited to 6 - 8 : 1. In Scottish teaching centres, the number of students in a clinical unit should not exceed 25.

One of the problems facing the medical student was recognized, that of gaining a unified medical knowledge in a medical school where nearly all of his lecturers were specialists.

The Curriculum:

"A drastic overhaul of the medical curriculum is an urgent necessity ... It is recommended that the General Medical Council should take the initiative in this matter without delay .... apart from the immediate revision, each medical schould keep its own course under continual review ...".(1) It was a leading proposal, and it was to be of some consternation to the G.M.C.

The medical student should be provided with an even cross-section of medical experience, which, would best be afforded in a teaching centre organised in 5 divisions - preclinical (anatomy and physiology in association with physical and biological sciences), pathology (four departments - morbid anatomy, bacteriology, chemical pathology, and clinical pathology), medicine (general medicine, child health, psychiatry, social medicine and other departments concerned with medical specialties), surgery (departments concerned with general and special surgery), and obstetrics & gynaecology. Goodenough recognized the difficulties of readjustment for medical students occasioned by the rapid transference from the preclinical to the clinical years, and it recommended an introductory course which could effect a smoother transition. It also proposed a"junior house officer" period of 12 months pre-registration experience after graduation.

1. p.p. 31, para. 12.

Postgraduates:

The primary teaching responsibility of an undergraduate medical school is to its undergraduate students, but this need not prevent a build up, "..to the fullest possible extent..",[1] of specialist trainees. Goodenough felt that there had been inadequate provision for postgraduates in Great Britain, and the Committee emphasized that there should be a vigorous postgraduate training system for a National Health Service.[2] London had exceptional resources as a postgraduate training centre and these should be utilized more fully, namely, by the reconstitution of the British Postgraduate Medical School as a federal organisation.

Accommodation and Equipment:

Goodenough felt that accommodation and equipment of the large majority of medical schools and teaching hospitals was inadequate for teaching and research. Extensive alterations would be needed to rectify deficiencies, and in some instances, a completely new medical school would be required.

Clinical Departments: The Committee recognized that there is bound to be a wide variation between schools according to local requirements, but in general, clinical accommodation should include: a lecture theatre (large - equipped with lantern, epidiascope, cinema projector, viewing boxes for X-ray films, projector for microscope slides, examination tables, patients' waiting rooms, and dressing cubicles),

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1. p.p. 33
2. Under its terms of reference, the Goodenough Committee was required to have regard to a White Paper, February 1944, on "A National Health Service".

staff room, pathological specimen room, library and reading room (an outlier of the main library), research laboratories (several, or one large laboratory divisible by partitions, and equipped with gas, electricity, water, and compressed air), metabolism investigation room (a series of single or double rooms with a special kitchen and small laboratory equipment), demonstration room, and photographic rooms.

Pathology Departments:[1] The main accommodation for the division should form a compact block in or adjacent to the parent teaching hospital. This accommodation should include: one or more museums (they may be combined with those for anatomy,and be centralized), mortuary and accommodation for post-mortem examinations and class demonstrations, staff accommodation, classroom laboratories, routine hospital laboratories, and research laboratories.

Classroom laboratories should be as close as conveniently possible to the main hospital investigation laboratories, for the availability of materials and apparatus, and to help the student to realize that pathology is an integral part of clinical medicine, not only an academic ancillary. The departments of Histology, Bacteriology, and Clinical pathology use similar apparatus and bench facilities, and they could share the same class room. Chemical Pathology bench arrangements are different, and the department will require a separate classroom. Routine laboratory accommodation (other than small ward laboratories): Preferably, the main laboratories should be separate, but they should be adjacent. They require a number of attached ancillaries, such as, media preparation, equipment sterilization, dark rooms, patient rooms

1. Remarks for Pathology may also be generally applied to the Preclinical departments.

for special tests and/ or examinations, plus patient waiting rooms. For Clinical Pathology, there should be a central clearing room for requests and specimens, and for record filing.

Actual ward laboratories need only be small. They should be attached to each ward or ward group - equipped for simple routine investigations - and they should also be available for use by resident house officers, students, and nurses.

Research laboratories: Small laboratory rooms are required for research by the regular departmental staff. The research laboratories should also include a group of laboratories equipped for one or more special research workers who may be attached to the division from time to time. In addition, research staff require to use the animal house, an animal operating theatre, the photographic department, a mechanical and a carpentry workshop. The Committee felt that as these facilities are also required by other departments, strong consideration should be given to the possibility of their being centralized to avoid unnecessary duplication.

Central Departments: Goodenough emphasised the desirability of centralizing accommodation which could be shared by the pathology and the clinical departments -"on grounds of efficiency, convenience, and economy .... the principle of centralization can be applied, among other things to .. laboratories .. photographic and art departments .. the library .. mechanical and carpentry workshops .. records .. stores and purchasing " (p.p. 271).

The advantages of grouped laboratories (additional to that of economy) were seen as interchangeability of laboratory areas, and the closer and more amenable contacts that they afford research workers. There should be one central library for the main book collection, with small departmental subsidiaries providing a representative collection for individual departmental staff and students. Anatomy and pathology specimens could also be housed centrally in a single museum, as mentioned previously.

On the question of a central animal house, the Committee noted that some staff considered it desirable that there should be separate animal facilities for physiology (and other non-clinical departments) and pathology (and clinical departments) on the grounds of them being more conveniently accessible, and in order to minimize the risk of cross infection. Goodenough did not consider that these problems would arise if medical teaching centres were developed, as it had recommended, "as compact geographical units, and if much of the laboratory accommodation is centralized." (p.p. 272).
The animal house should be staffed by attendants who are fully trained, and who are experienced in the methods of controlling cross infection. The Committee was of the opinion that if these requirements were to be met, a central animal house would be desirable because of its "economy in space and money." (p.p. 272)

THE NATIONAL HEALTH SERVICE (N.H.S.)

The N.H.S. took effect as from 5th July, 1948, when the Ministry of Health took over the responsibility for 2835 voluntary and municipal hospitals out of a total of 3040 in England and Wales - this also included convalescent homes and certain types of clinics.[1] Of this number, 45% had been erected before 1891, and 21 % before 1861.[2] Following closely the pattern of wartime zoning, hospital and specialist services for the country came to be administered over 14 regional areas,[3] and the changeover on the appointed day was accomplished with little or no apparent inconvenience. The important factor,as far as voluntary and municipal hospitals were concerned, was the change in the overall hospital structure. Regional Hospital Boards and Boards of Governors assumed new roles as "administrators' agents", in lieu of "administrators".

In the hospital service as now administered, Regional Boards are responsible for the hospitals of the regular service; their members are appointed by the Minister, and their function is to determine the general hospital and planning policy for the area - they in turn appoint their own local agents or Hospital Management Committees. Teaching hospitals are the responsibility of Boards of Governors who are committed,in addition to normal hospital administration, to providing adequate accommodation in the hospital for medical teaching and research; their members are appointed by the Minister, but they differ from the Regional Boards, in that, by reason of a divided allegiance to medical schools and universities, some members are

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1. Ministry of Health Report, 1949.
2. "A Hospital Plan for England & Wales", 1961, p.p. 1.
3. Now 15.

nominated by the medical staff. Boards of Governors are responsible for their area, and they exercise an authority equal to that of the Regional Boards and Hospital Management Committees combined.

The medical teaching institutions involved in the N.H.S. transfer were of four broad types:[1]

London "Undergraduate" Teaching Hospitals: With an attached medical school, they operated an integrated system of undergraduate and postgraduate teaching, plus other hospital functions.

Specialist Hospitals: The majority of these sprang up in the 19th century. They were centred on London, which,by virtue of a large population, was ideally suited to specialized clinical treatment and care, and the training of postgraduate students. These hospitals now make up the British Postgraduate Medical Federation of the University of London.

Provincial Teaching Hospitals: These were something of a combination of the two former types.

Special Hospital Units: These came into prominence during the war. A greater incidence of injury led to the formation of emergency medical units, by specialists, for the treatment of diseases or injuries to certain parts of the body, for example, chest surgery, plastic surgery, and neurology.

London and Provincial "Undergraduate" Medical Schools (and Teaching Hospitals), only, will be considered in this thesis.

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1. There were 12 London undergraduate, 10 Provincial undergraduate, and 14 London postgraduate institutions. ("A Hospital Plan for England & Wales", 1961.)

The following terms will also apply:[1] "London Undergraduate Medical Schools" - these will be as described previously. "Provincial Undergraduate Medical Schools" will include all English and Scottish undergraduate medical schools (excluding London).

STAFF GRADING IN THE N.H.S.: THE SPENS GRADES[2]

A system of staffing to meet the requirements of the N.H.S. required early consideration, and in May 1947, the Minister and the Secretary of State for Scotland appointed the Spens Committee to "advise" on a new staffing and salary structure. Spens made the following recommendations on staff grading, after they had been reviewed by the medical profession:

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1. Goodenough provided the following definitions which will also apply in this thesis:

   University Medical School: ".....a faculty of Medicine, college or school of a university; such college or school need not be concerned solely with medical students." (p.p. 8, para. 11).

   Teaching Hospital: "..... any hospital to which a medical school is allowed access for the clinical training of its students. We have regarded these hospitals as of two types: (i) the parent hospital (which is the hospital most closely associated with a medical school, and in which the major part of the students' clinical training will normally be provided) and (ii) the associated teaching hospital." (p.p. 8, para. 12).

   Post-graduate medical school: "Whereas, in addition to training undergraduate students, all medical schools will take part in some form of post-graduate medical education, in most cases in connexion only with the training of future specialists, there are and will continue to be educational institutions and hospitals concerned solely with post-graduate medical education." (p.p. 8, para. 13).

2. Report of the Inter-Departmental Committee on the Remuneration of Consultants and Specialists. Chairman Sir Wil Spens.

Junior Registrar (changed to Senior House Officer in 1950 to avoid confusion with the senior grades): normally obtained not less than one year after registration, and held for one year.

Registrar: normally obtained not less than 2 years after registration, and held for 2 years.

Senior Registrar: normally obtained not less than 4 years after registration, and held for 3 years (it was protracted to 4 years in 1951).

Consultant: appointment to follow Senior Registrar if a post is available.

Two other grades were added later: Senior Medical Officer - a grade between Consultant and Senior Registrar, more permanent, and designed to allow experienced doctors, for instance general practitioners, to come into the service. Junior Medical Officer - a grade lower than S.M.O. who was not a Registrar.

Before 1950, under the grade system, it was assumed that all hospital posts were trainee posts for a special branch of medicine. The system was modified after this time and not meant to specifically imply trainee posts.

WILLINK REPORT, 1957:[1]

The inadequacy of medical school accommodation, which had been criticized earlier by Goodenough, was little improved by 1957. Medical schools were still generally overcrowded, antiquated, underfinanced, and with few exceptions, they were finding the task of teaching their respective student bodies beyond their capacities. The deficiencies accounted for a general tendancy for schools to cut down their intakes in the interests of maintaining standards.

The Willink Report was at great pains to emphasize the conjectural nature of its findings. The Committee's recommendations which actually referred to medical schools, seemed to be an official acknowledgement of a situation already existing. It can probably be summarized by - "our estimate suggests that a reduction of the student intake by about a tenth from as early a date as is practicable, would meet the case" (p.p. 33, para. 115).

PLATT REPORT, 1961:[2]

The Committee was appointed under similar terms of reference to Spens. It reviewed the hospital grades and recommended the abolition of the Medical Officer grades; Platt's proposal was that they should be replaced by a more general and flexible "Medical Assistant" grade.

Platt had not been specifically appointed with medical education in mind. However it did make a number of observations which could affect teaching hospitals. Perhaps the most important of these

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1. Report of the Committee to Consider the Future Numbers of Medical Practitioners and the Appropriate Intake of Medical Students, 1957. Chairman Sir Henry Willink.

2. Report of the Joint Working Party on Medical Staffing Structure in the Hospital Service, 1961. Chairman Sir Robert Platt.

observations drew attention to the gross shortage of junior hospital staff, which, would be even more acute but for the assistance by approximately 34% of this number of staff who had been trained outside Britain. The shortage seemed to contradict Willink's earlier suggestion that there should be a general reducation in the number of medical students.

Platt perceived problems pertaining to the training, and of the future role of the general practitioner in the N.H.S. It recommended that potential general practitioners should have spent at least two years in the hospital service after full registration. The Committee's recommendation was also aimed at alleviating the junior staff shortage.

Criticism was brought to bear on the isolationist autonomy of some "firm" consultants.

A HOSPITAL PLAN FOR ENGLAND AND WALES, 1961:

The White Paper, which came out in January 1962, was designed to give a comprehensive survey of the present hospitals in the hospital service, with proposals for their overhaul in the coming 15 years. Nearly all teaching hospitals are to be improved in one way or another; many will be rebuilt, and in the case of the London teaching hospitals - Charing Cross, St.George's, and the Royal Free, these will be relocated along the general lines advocated by Goodenough.

Whilst teaching hospitals make up only a small proportion of the total hospital number, the publication expressed the "important part" that they play in the hospital service. A pertinent comment expressed a primary function of the teaching hospital in respect of its medical school - ".... the size and location of the individual teaching hospital and the type of beds must be determined by their function of providing facilities for clinical teaching " (p.p. 8). It vents the official attitude on the desirability of perpetuating the clinical apprenticeship system.

ROBBINS REPORT ON HIGHER EDUCATION, 1961-63:[1]

A committee on Higher Education was appointed 8th February, 1961, to "review the pattern of full-time higher education in Great Britain" (p.p. 1), with a view to present and future national requirements. The Committee's Report (which has only been released recently) is an extensive and voluminous survey , with accompanying recommendations, covering a wide variety of aspects on universities and other institutions for higher education.

The Robbins Report came out during the compilation of this thesis. It was found that much of the work that had been done by the author on medical schools overlapped and duplicated a number of sections of the Report which referred to medical education; this was largely due to a common source of information - University Grants Committee annual Returns for Universities and Colleges in this country. Other data is taken from Robbins as it is relevant to medical schools, and to this thesis. A more extensive coverage of some of Robbins' findings is given in Part 2 of this chapter.

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1. Report of the Committee on Higher Education, 1963. Chairman Lord Robbins.

DUNDEE SYMPOSIUM, 1961:

The symposium was arranged by St.Andrew's University and the Scottish Eastern Region Hospital Board to enable a small group of doctors, architects, and mechanical consultants to meet, and to discuss their experiences and views on the design of teaching hospitals.

The teaching hospitals discussed were: the University of Washington Medical Centre, Seattle, U.S.A., the National Institute of Health, Bethesda, U.S.A., Stanford Medical Centre, Palo Alto, U.S.A., St.Thomas's Hospital, London, the Welsh Medical Teaching Centre, Cardiff, Ninewells Teaching Hospital, Dundee. The one exception to this group is the National Institute of Health, Bethesda, which is primarily a centre for research, with extensive clinical research facilities.

A wide variety of topics was considered during the Symposium, but throughout, there was a recurring emphasis on the basic functions of a teaching hospital, namely, teaching, research, and service. The method by which an architect must set about integrating these functions in a hospital and medical school design presents him with numerous problems. The term "embedding" was used in reference to the integration procedure.

Teaching: A major planning problem in any teaching hospital design is that of increased traffic - and its its congestion - occasioned by large numbers of students. As far as possible, students have to be separated from research and patient care areas.
The traditional ward round was seen as likely of being superceded by patient demonstration, and student teaching, in a demonstration room adjoining the ward. There was also general agreement on the

need for more ward facilities for student discussions, studying patient records, and simple laboratory procedures. Like sentiments apply to the actual medical school, and in this regard, the student should have a "base" for his own private use - the traditional seat in the library is not enough. The o.p.d. was recognized as of increasing importance as a teaching venue, although, there was not agreement on the teaching methods to be adopted. Postgraduate students will need more facilities than are currently provided.

Research: The importance of research was recognized, but there was a marked difference in the research facilities of the teaching hospitals discussed. Basic research activities should be kept apart from patient care areas; these facilities should be capable of development to accommodate a certain future growth of research. Standardization of research laboratory accommodation, as shown by Nuffield studies, can effect economies in layout, and of servicing, and it can be made to fit a wide range of disciplines. Standardization along similar lines might also be applied to other areas of the teaching hospital, for example, the ward and the library. In recent years, there has been a large expansion in the use of animals, radio-isotopes, and electronic equipment in research.

Service: The teaching hospital must offer a community service and continuity of care if it is to provide an adequate range of patients for student teaching. The three British teaching hospitals favoured a "T" ward arrangement. There was some disagreement on the advantages, or otherwise, of the "racetrack" ward as used, for example, at Stanford (see Figs. 7 & 8).

There was no concurrence on the most suitable location of laboratories for patient investigation and routine procedures. To house them on the ward is perhaps desirable, but it is an expensive duplication of laboratory activities; if they are sited in the main laboratory complex, they could become too remote from the wards - there will usually have to be a compromise.

General Architectural Aspects: St.Andrew's teaching hospital is the first British teaching hospital of over 700 beds to adopt a building concept which is primarily horizontal. Stanford adopts a similar approach in its design.

The teaching hospital, in addition to scope for research development, must be capable of reasonable change and general internal development.

Departmental and other teaching hospital accommodation should have better mechanical ventilation and artificial lighting.

More adequate facilities are required for workshops and stores.

CONTROLLING BODIES ON MEDICAL EDUCATION

The University Grants Committee (U.G.C.) and the General Medical Coundil (G.M.C.) are the two statutory custodians of British medical education and medical schools. Some reference will be made to the work of these bodies.

UNIVERSITY GRANTS COMMITTEE:

> As per its terms of reference, July 1946, the U.G.C. is required - "to enquire into the financial needs of university education in Great Britain; to advise the Government as to the application of any grants made by Parliament towards meeting them; to collect, examine and make available information on matters relating to university education at home and abroad; and to assist, in consultation with the universities and other bodies concerned, the preparation and execution of such plans for the development of the universities as may from time to time be required in order to ensure that they are fully adequate to national needs." (1)

To this end, the U.G.C. makes an annual documentary return to the government reporting on university events; additionally, the document provides data on staff and student numbers for all of the British universities.(2) The U.G.C. also prepares a quinquennial report on university events, with recommendations for future university financial needs.(3).

The government through the treasury (and the U.G.C.) finances the universities by "grants-in-aid". There are two types: (1) Recurrent Grants: staff salaries, departmental running costs, maintenance of premises, etc. (2) Non-Recurrent Grants: new buildings, furniture and equipment for new and adapted buildings (or departments),

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1. Report on University Development, 1935 - 1946, p.p. 7.
2. Returns from Universities and University Colleges in Receipt or Treasury Grant.
3. University Development-Quinquennium Reports.

purchase of sites and properties, and professional fees. Non-Recurrent grants are given on an annual basis and are of the most concern to architects.

U.G.C. quinquennial reports give a fair insight into medical school happenings in the post-war period. In summary, some of the more important of these are as follows: stabilization of medical school admissions since 1938-39, wider adoption by medical schools of the policy of whole-time university appointments, absorption of the extra-mural schools, development of postgraduate medical education, accretion of the medical curriculum and the little progress that had been made towards its simplification, the increase in specialization and a decline in esteem of the general practitioner. The U.G.C. also noted the difficulties experienced by medical students in obtaining a general medical education in teaching hospitals which are mainly specialist institutions. There was early ambiguity in the N.H.S. as to what amount of contribution Boards of Governors, and the Universities should make to the accommodation for clinical teaching and research; the difficulty was resolved later. A notable feature of the 1947 - 52 report was the U.G.C.'s plaudits of the implementation of many of the Goodenough Committee's recommendations.

GENERAL MEDICAL COUNCIL

Under the Medical Act of 1858, the General Council of Medical Education and Registration of the United Kingdom was appointed to the primary task of supervising medical education in this country. The Council has normally carried out this "task" by "Recommendations" which have been published sporadically for the guidance of its administrating agents - "Licensing Bodies" or "Bodies". These Bodies play an important role in the training, registration, and examination of undergraduate and postgraduate medical students.

In the strict sense "Licensing Body" applies solely to the G.M.C., for it is the only statutory Body in Britain with the power to refuse, or to grant, the right of medical registration. More loosely, it has come to mean all Bodies (in Britain and Eire) which are supervised and recognized by the G.M.C. as being able to grant a medical degree, diploma, or licence - as distinct from registration. Licensing Bodies are of two categories: (1) The Universities: those in a teaching and examining capacity. (2) The Corporations: those in an examining capacity only. The undergraduate diploma commonly granted by the Corporations is the conjoint award of the Royal Colleges of Physicians and Surgeons - L.R.C.P.,M.R.C.S. A list of G.M.C. Licensing Bodies is given in Appendix 2.

Many of the problems confronting medical education today have been attributed to G.M.C. Recommendations on the medical curriculum. A summary of the 1947 Recommendations is given in Appendix 1.
It was the last, and indeed the longest, of the documents on the traditional "Preclinical/ Clinical" formula, a pattern which often

finds expression in the distinctive separation of Preclinical and "Clinical" medical school buildings.

"It was the severe criticism of the medical curriculum made by the Committee (Goodenough) which gave the question of revision its immediate urgency."[1] This statement seemed to summarize the impact of the Goodenough Report on the G.M.C. So effective was it, that only 1/6th of the 1947 Recommendations dealt with the actual Curriculum; the remainder discussed many of the points which had been raised by Goodenough. Notwithstanding, the 1947 Recommendations hardly appeared to represent an enlightened attitude on the traditional curriculum.

Protest did not pass unheeded however, and in the ensuing years the Council carried out a close inspection of the medical schools under its charge. The outcome was a new set of recommendations in 1957.[2] It was not even necessary to open the new document to realise that there had been a considerable modification of the previous; in terms of bulk alone it had been reduced from 68 to 15 pages (see Appendix 1b for summary). The G.M.C. recognized that the precision of the earlier recommendations had probably "left insufficient scope for the exercise of initiative and experiment on the part of Licensing Bodies and of Schools"[3], and in the 1957 Recommendations it allowed a much greater degree of lattitude by deliberatly refraining from stipulating the order of subjects, and of their duration. The examination procedure, too, was much simplified. It was the Council's intention, at a later date, to ask each Licensing Body to submit a statement of its intended

1. G.M.C. Recommendations as to the Medical Curriculum, 1947(p.p. 9).
2. Ibid. 1957.
3. Ibid. 1957, p.p. 4.

policy in regard to their courses and examinations, and, how these are to be implemented. In a similar vein, the Council invited medical schools to report on any changes of a radical nature. There had also been a call for reducing the length of the curriculum. In reply, the Council intimated that whereas there were grounds for considering such a reduction, it would be necessary at first for medical schools to familiarise themselves with the implications of the new recommendations, before contemplating a reduced medical course.

MEDICAL ACT, 1950:

There were two important aspects arising out of the Act which had an important bearing on medical education. The first rectified an 1858 anomaly, and the curious powers vested in the G.M.C. The Council was, for instance, empowered to appoint inspectors to visit the examinations of Licensing Bodies, and to ask for details of their curricula, examinations, and the ages of students, but it was not able to enforce these powers. The 1950 Act gave the G.M.C. the necessary full authority on the control and supervision of medical education, and it was undoubtedly one of the contributory factors to the Council's new attitude on the 1957 Curriculum. The second aspect referred to compulsory pre-registration house experience, making it a compulsory prerequisite for full medical registration. The period was fixed by the G.M.C. at 12 months - normally 6 months in medicine and 6 months in surgery or midwifery. Examinations were not to form a part of the preregistration year.

PART 2: RELEVANT FACTORS ARISING OUT OF THE REPORTS

Issues consequent upon events in the post-war period involve nearly all medical aspects; principal amongst these are factors directly, or indirectly concerning staff and students, and the requisites of their accommodation.

Hospital nationalisation in its early years would seem to have altered little the pre, and post-war didactic path followed by medical schools; it did, however, mean a shift of responsibility for hospitals (including teaching hospitals) to the Ministry of Health. The outcome of the changed administration was undoubtedly beneficial to teaching hospitals. Even apart from the financial aspect, it gave a wider selection of clinical material which was not possible previously, especially with the rivalry that existed between the regional and voluntary hospitals. Not so beneficial was the change in teaching hospital/ medical school relationships; formerly one of "parental" concern of the teaching hospital for its medical school, the new association became ambiguous to some institutions and required of them a considerable readjustment under the new common authority.

Documents emanating from a number of government sources have been the controlling instruments, in varying degrees, on medical education and on medical schools in the post-war period. The first and foremost of these was the Goodenough Report.

THE ORGANIZATION OF BRITISH MEDICAL SCHOOLS

As described by Flexner, British medical education has evolved on a "layer"[(1)] system of development, each layer providing the base, and the stepping stone for the successive layer; Flexner accorded it the best at that time. The "layers" in British medical education are, according to the 1947 G.M.C. Recommendations, Premedical, Preclinical, and Clinical.

It is not possible to define any one medical course now operating in Britain due to the abrogation of G.M.C. aims in 1957, and the likely demise of the "layer" system. The medical courses of most schools are at present under review, and it is unlikely for some years to be able to compare the results of educational experiments. The form of the 1957 Recommendations makes no attempt to differentiate between the former Preclinical and Clinical divisions of the medical course, as it is the G.M.C.'s professed intention to encourage the integration of all subjects. This intention is recognized by the author, but for convenience in this thesis the terms"Preclinical"and "Clinical" will be used.

Premedical:

It is a period of one academic year terminated by the 1st M.B. Examination. It may be taken at the medical school, although there has been an increasing tendency in recent years for schools to allow "1st M.B. exemption"; the subjects are taken at the secondary school, and admission to the medical school made subject to the student gaining the school's requisite number of "A" and/ or "O" level passes.

1. Flexner A. Medical Education. p.p. 41 & 58.

Intending medical students to the Premedical year at medical school must satisfy university admission requirements.

Preclinical:

It is a period of two academic years terminated by the 2nd M.B. Examination. This part of the course has its origins in the early Anatomy schools. In the first half of this century, attitudes on anatomy and physiology underwent a steady decline by doctors who, as students at the start of their careers, remembered the subjects as boring academic innessentials which had to be tolerated before the "real business" of medicine began in the wards. The common outlook arose no doubt from teaching methods and equipment which seemed hardly to have changed from those of the Anatomy schools. Fortunately the sciences have not stagnated, and there are now so many off-shoots that they would hardly bear comparison with the same subjects of former years. Anatomy, physiology, and their proliferations, are once again beginning to assert a rightful influence on the spectrum of medical school subjects.

Preclinical department subjects have obvious teaching and research functions. It is possible - if these departments are a part of the teaching hospital - that they will also provide a routine service of some type, either in association with the medical school Clinical departments, or directly with the teaching hospital, or possibly with both.

Clinical:(1)

Is a three year period terminated by the final examination for the university degree - M.B.,B.S., or M.B.,Ch.B., or other variations. The 1947 Recommendations define Clinical subjects as all of those taken after the 2nd M.B. examination, prior to the completion of the degree, for example, medicine, surgery, obstetrics & gynaecology, pathology, bacteriology, social medicine, etc. To avoid ambiguity later in this thesis, the term "Clinical" will imply <u>all</u> 3rd, 4th, and 5th year subjects (1947 G.M.C. Curriculum terminology) and the term Clinical (without inverted commas) will imply <u>patient care only</u> subjects.

Clinical Departments: These have a direct patient care, patient investigation (routine and research), and student teaching responsibility (undergraduate and postgraduate students).

Medical school Clinical departments come under two general sub-headings, "Medical" and "Surgical". As founder sciences of clinical practice, these Clinical "Sub-divisions" now posses a large and ever-expanding number of specialties. The emphasis in the undergraduate medical course in on the older and more general of the specialties; the relative importance attached to "newer" specialties varies with each medical school. The following are some of the more common Clinical specialties:

Sub-division of "Medicine":

Medicine (department as distinct from sub-division)
Therapeutics
Dermatology
Respiratory Diseases
Psychiatry
Geriatrics
Venereal Diseases
Radiotherapy

1. Clinical - "of or at the sick bed" (Oxford Pocket Dictionary)

Sub-division of "Surgery":

Surgery (department as distinct from sub-division)
Obstetrics or Midwifery
Gynaecology
Paediatrics
Anaesthetics (may also come under paraclinical- see later)
Orthopaedic Surgery
Opthalmology
Otolaryngology
Otorhinolaryngology
Surgical Neurology
Thoracic Surgery

Clinical departments have a tripartite responsibility of service, teaching, and research. The two former are generally discharged in the teaching hospital, the latter, in the actual medical school (although a small amount of Clinical teaching is carried out here also). It can be seen by this that: (1) Clinical staff (and students) require access to both teaching hospital and medical school, and it would seem prudent therefore, that the two should be in close proximity. (2) Research is the primary function of Clinical departments in the medical school (actual).

The service and teaching aspects of Clinical departments (as they apply to the hospital ward) will be discussed in Part 3 of this chapter. A detailed analysis of these aspects will not be made in this thesis as they come outside the scope of architectural study in Chapter 3, which is concerned with the actual medical school

Paraclinical Departments: The traditional terminology has been "Pathology". It is becoming seemingly less appropriate with an ever increasing number of medical specialties; in this thesis, the term "Paraclinical" will be used. As the name implies, Paraclinical[1] supplements the work of Clinical, although supplementary Clinical service is but a part of the functions of a Paraclinical department. These functions may be seen as:

1. Service or routine research in collaboration with the patient investigation and research functions of Clinical departments; they also consort with other Paraclinical departments on research or service projects of common and overlapping interest. Paraclinical departments do not have a direct patient responsibility, although, there has been a more recent tendency for some schools to bring patients directly to the departments. There is disagreement on this practice.

2. Basic medical research or other exploratory investigation. Animals form an integral part of these procedures. In this country, by law, undergraduate students are not allowed to engage on live animal research, although the prohibition does not necessarily hold with other countries, for example, America.

3. Teaching and instruction of undergraduate and postgraduate students. For students in the paraclinical departments, there is less emphasis placed on ward apprenticeship and more time given over to practical work in the teaching laboratory, plus formal teaching in the lecture

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1. Para - "beside" (Greek); "protection against" (Latin) (Oxford Pocket Dictionary)

theatre, seminar room, etc. There is, however, some clerkship, and it is also necessary for students to witness the work of the staff and to attend clinico-pathological conferences.

The following are some of the more common of the Paraclinical specialties:

Pathology
Bacteriology (and/ or Microbiology)
Chemical Pathology
Morbid Anatomy (Histopathology)
Histology
Immunology
Social & Preventive Medicine
Forensic Medicine and Toxicology
Diagnostic Radiology
Haematology
Medical Physics
Pharmacology (may also come under Preclinical)
Biochemistry (" " " " ")

Summary functions of a University Medical School:

All teaching hospital medical schools are comprised of Clinical[1] and Paraclinical[1] departments; some teaching hospital schools also include Preclinical departments(inc. Premedical). There summary functions are:

Clinical Departments: Teaching + Research + Service

Paraclinical Departments: Teaching + Research + Service

Preclinical Departments: Teaching + Research + Service

The basic functions of a medical school are therefore:

Teaching (T), Research (R), & Service (S).

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1. All of the medical school departments which go to make up Clinical, or Paraclinical, or Preclinical, will be referred to as "Divisions" in this thesis.

MEDICAL SCHOOL STAFF

The Goodenough Report reflected the critical shortage of medical school staff that was available for teaching in 1939. Much of this teaching in the medical school was incidental to the work of teaching hospital staff who were underpaid (or were unpaid), and the universal shortage can easily be understood. Nationalisation has been responsible for a wide measure of reform, for example, all academic posts are now paid, an increasing number of full-time professorial and other full-time teaching posts have been created, the position in regard to accommodation and equipment, although still bad, is a little improved following pronouncements in the publication "A Hospital Plan for England & Wales". Nevertheless, these remain only a measure, and much will hinge on future governmental attitude and the availability of finance. (see Footnote1).

STAFF NUMBERS:

Ratios in Table 1 show the gross inadequacy of medical school teaching staff in 1938/39. Subsequent events in the post-war period have brought medicine more into line with other university faculties. The ratios should be regarded with some reservation, for, as Robbins points out, a good proportion of staff can be "expected to do little or no teaching"[2] (the medical faculty in particular).

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1. In the following pages, a number of tables and figures are provided in connection with various discussions in this chapter. Unless indicated otherwise, these tables and figures will be exclusive of the Oxford and Cambridge medical schools.

2. Higher Education, Appendix 3, p.p.5.

TABLE 1

Full-time medical undergraduates and postgraduates per full-time teacher. Source: Robbins Report, Appendix 3, p.p.5. Origin U.G.C.

Undergraduates 1938/39	Undergraduates 1961/62	Postgraduates 1938/39	Postgraduates 1961/62
27.6	5.6	0.4	0.4

N.B. Ratio full-time medical students (all) per full-time teacher 1954/55 was 7.0 : 1

TABLE 2

Work of Medical teachers during term: average hours per week; 1961/62. Source Robbins Report, Appendix 3, p.p. 57.

	Teach.	Prep. & corr-ection	Teach. prep. & corr-ection	Res-earch	Admin.	Other	All profess-ional work
Preclinical	7	3	10	16	3	11	40
"Clinical"	6	2	8	12	4	17	42

TABLE 3

Work of medical teachers in term and vacation: as a percentage; 1961/62. Source: Robbins Report, Appendix 3, p.p. 62.

	Teach., prep., corr-ection	Res-earch	Private study	Admin.	Other work within the univ-ersity	Work outside the univ-ersity	All working time
	Work during term						
Preclinical	25	40	12	8	9	6	100
"Clinical"	19	29	13	9	13	17	100
	Work during vacations						
Preclinical	7	51	14	8	14	6	100
"Clinical"	11	29	10	8	26	16	100

TABLE 4 Teaching, research and administration for medical faculty during term; 1961/62. Source: Robbins Report, Appendix 3, p.p. 59.

	Teaching, preparation and correction	Research	Administration
	Percentage of teachers spending more than 20 hours per week	Percentage of teachers spending more than 22 hours per week	Percentage of teachers spending more than 8 hours per week
Preclinical	11	31	11
"Clinical"	8	19	13

TABLE 5 Percentage and actual time attributable to research by medical faculty, 1961/62. Source: Robbins Report, Appendix 3, p.p. 67.

	Actual time	Percentage time
Preclinical	40 hours	59%
"Clinical"	29 hours	58%

TABLE 6 Ratios of medical staff (all) by divisions, for British medical schools, 1963. Source: Appendix 3.

	Clinical	: Paraclinical	"Clinical"	: Preclinical
Birmingham	1.5	: 1	1.6	: 1
Bristol	2.0	: 1	1.7	: 1
Newcastle	2.6		5.3	
Leeds	1.3		3.8	
Liverpool	2.3		5.3	
Manchester	2.3		4.9	
Sheffield	2.5		2.4	
Wales	2.0		1.6	
	2.0	: 1	2.4	: 1
Aberdeen	3.0		16.4	
Edinburgh	2.5		3.2	
Glasgow	1.6		3.8	
St.Andrews	2.5		4.5	
	2.2	: 1	4.5	: 1
Charing Cross	2.9		2.5	
Guy's	3.5		3.2	
King's College	2.0		-	
London	4.0		4.6	
Middlesex	7.8		2.3	
Royal Free	6.1		2.8	
St.Bart's.	4.0		3.2	
St.George's	2.6		-	
St.Mary's	4.7		2.4	
St.Thomas's	3.6		3.9	
U.C.H.	3.5		-	
Westminster	5.7		-	
	3.4	: 1	3.0	: 1

FIGURE 4. Medical school academic staff by grades, in Great Britain, 1953/54, 1956/57, 1961/62.
Source: U.G.C. Returns 1953/54, 1956/57, 1961/62.

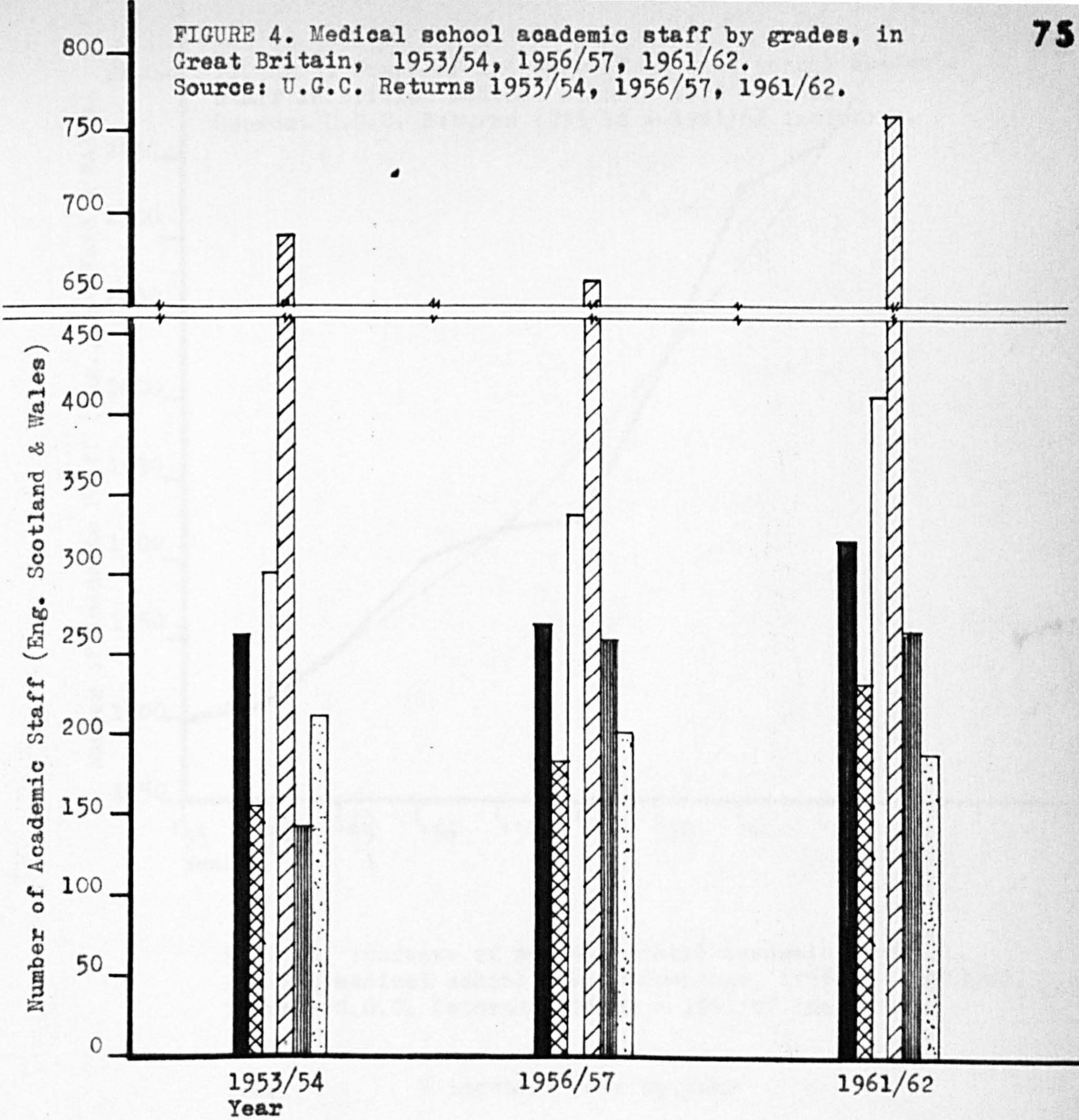

TABLE 7. Breakdown of medical staff grades by percentage in British medical schools, 1961/62. Source: U.G.C. Returns 1961/62.

14.8%	Professors
10.6	Readers
19.0	Senior Lecturers
34.9	Lecturers
12.1	Assistant Lectrs. & Demonstrators
8.6%	Others

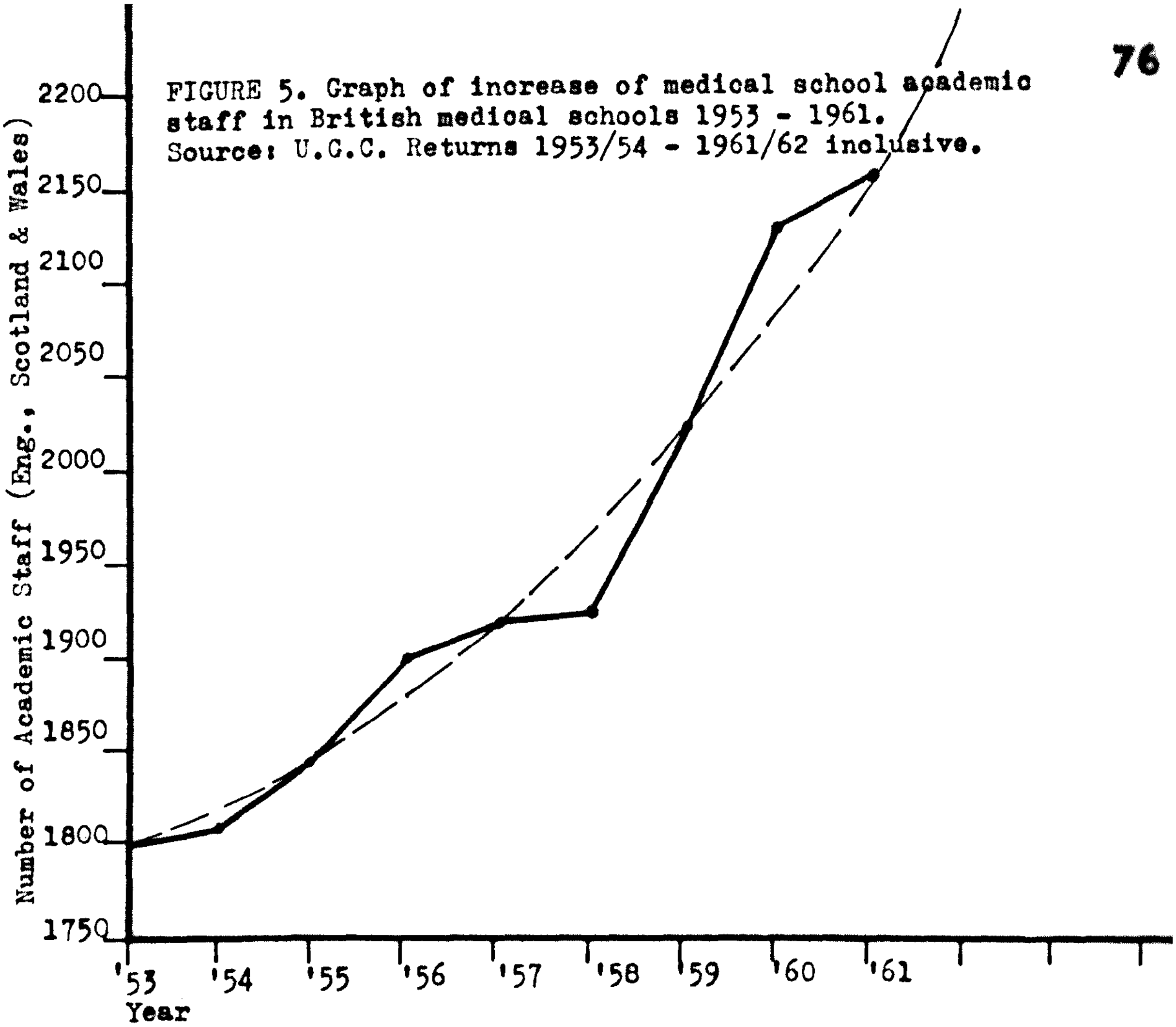

TABLE 8. Increase of medical school academic staff in British medical schools, by percentage, 1954/55 - 1961/62.
Source: U.G.C. Returns 1954/55 - 1961/62 inclusive.

Year	% increase year by year
1954/55	0.61
'55/56	1.82
'56/57	3.09
'57/58	1.00
'58/59	0.32
'59/60	4.94
'60/61	5.69
'61/62	1.31
	Av.2.47

Academic staff increase 1954/55 to 1961/62 - total 22%.

TABLE 9 All staff engaged on research, expressed as a percentage of all medical school staff, 1962/63. Source: Appendices 3 & 4.

	Clinical	Paraclinical	Preclinical	All
Birmingham	48.5	72.1	72.7	63.8
Bristol	41.0	46.4	73.0	53.9
Newcastle	111.0	68.9	52.7	92.2
Leeds	80.0	69.1	75.0	75.0
Liverpool	73.8	51.0	80.6	68.5
Manchester	63.7	85.0	41.3	65.2
Sheffield	35.9	57.6	78.6	52.9
Wales	40.0	51.5	76.6	56.5
	60.7%	64.3%	71.3%	64.5%
Aberdeen	34.2	41.5	50.0	36.8
Edinburgh	63.4	84.2	50.0	64.8
Glasgow	80.4	51.2	82.5	71.9
St.Andrews	38.1	12.3	24.4	25.6
	54.4	51.9	55.4	54.0
Charing Cross	94.3	97.0	57.9	81.8
Guy's	126.8	246.1	188.9	161.8
King's College	104.1	84.0	-	97.3
London	111.4	136.4	150.0	122.4
Middlesex	69.2	420.0	216.0	141.3
Royal Free	148.8	85.7	144.5	141.3
St.Bart's.	272.0	222.1	243.0	257.8
St.George's	86.6	147.0	-	103.2
St.Mary's	77.2	246.0	130.0	125.0
St.Thomas's	27.9	91.6	121.6	58.0
U.C.H.	50.0	192.0	-	81.5
Westminster	23.5	216.7	-	52.4
	154.5	99.3	161.3	120.5

TABLE 10 Ratio increases of staff engaged on research in British medical schools - years 1951/52 & 1962/63. Source: Appendix 4

	Clinical	Paraclinical	Preclinical	All
Birmingham	1.4	2.4	1.9	1.8
Bristol	4.8	1.7	1.4	1.9
Newcastle	3.0	1.3	1.1	2.2
Leeds	1.8	1.0	0.9	1.2
Liverpool	3.3	2.1	1.6	2.5
Manchester	2.3	2.4	1.0	2.1
Sheffield	2.9	1.0	1.5	1.6
Wales	1.2	1.2	1.3	1.3
	2.3	1.6	1.4	1.8
Aberdeen	2.6	9.0	1.0	2.8
Edinburgh	2.7	3.2	1.3	2.4
Glasgow	2.0	1.6	1.3	1.7
St.Andrews	1.9	0.4	0.5	1.0
	2.3	2.1	1.2	1.9
Charing Cross	$\propto$	5.0	0.7	3.2
Guy's	1.6	1.6	1.0	1.4
King's College	2.3	1.3	-	1.9
London	1.0	0.8	1.3	1.0
Middlesex	1.6	1.4	1.5	1.5
Royal Free	21.3	0.7	1.0	2.5
St.George's	$\propto$	1.8	-	4.6
St.Mary's	1.1	1.9	1.2	1.3
St.Thomas's	1.7	1.1	0.9	1.1
U.C.H.	0.6	0.9	-	0.7
Westminster	0.4	1.6	-	0.8
	1.8+	1.3+	1.1+	1.4+

\+ Staff numbers for St.Bart's discounted.

An indication of the rate of staff increase in British medical schools in the post-war period is given in Table 8 and Figs. 4 & 5. It can be seen that the expansion of all academic grades has been about the same by proportion; the category "Others" has shown a general falling off.

In a University Teachers survey, Robbins assessed the ratio of medical school staff per head of department as 4.8 [1] : 1 (1961/62). A breakdown of medical school staff grades by percentage is given in Table 7 (same year). All of Robbins figures are based on academic staff totals.

In the absence of information on total numbers of medical staff in individual medical schools, an attempt has been made by the author to ascertain these figures from an alternative source to that used by the Robbins Committee. The Commonwealth Universities Year Book (1963) gives all university staffs individually by name and by department; these have been counted for each medical school, and the respective totals listed under Preclinical, Clinical, and Paraclinical divisional headings (see Appendix 3). From these totals, it has been possible to examine , in more detail, aspects on medical schools which were not covered by Robbins. The first of these aspects was an examination, by ratio, of staff divisions in British medical schools (see Table 6). In the "Clinical" : Preclinical table[2], English Provincial schools show the smallest ratio; it is an indication of a more favourable proportion of Preclinical staff available for teaching and/ or research in the English Provinces, by comparison with the Scottish and the London schools. In the Clinical : Paraclinical table[2], the London schools

1. Higher Education, Appendix 3, p.p. 18.
2. Discussion is based on the summary ratios for London, the Provinces,and Scotland.

show a higher ratio in favour of Clinical, suggesting that there is a greater Clinical emphasis in these schools than in those of the Provinces and Scotland. The higher ratio does not, however, indicate whether this Clinical emphasis is on teaching, research, or patient care; it could be one, or a combination of two, or all three (see later comment under "Staff Research").

BREAKDOWN OF STAFF WORKING TIME:

As shown in Tables 2 & 3, medical school staff are subject to a number of disciplines over and above those of actual teaching and research; nevertheless, these two disciplines do make up the biggest apportionment of staff working time. Table 3 indicates the big increase of research over teaching as would be expected for Preclinical staff during vacation. Time spent on research by "Clinical" staff remains the same during vacation; the transfer from teaching time is mostly to "Other" work within the university, a large proportion of which, it could be assumed, would be concerned directly with the patient in the case of Clinical staff, and on routine procedures in the case of Paraclinical staff.

In British medical schools -1961/62 (Table 4), about $\frac{1}{3}$ of Preclinical and 1/5 of "Clinical" staff were engaged on research for 50% of the working week (40 hour basis); approximately 1/10 of Preclinical and "Clinical" staff spent $\frac{1}{2}$ of their working week on teaching (during university term). The figures for research serve to emphasize its importance in medical schools at the present time.

RESEARCH:

In 1959, the U.S. Department of Health, Education, and Welfare conducted a survey of 20 medical schools in America,(1) and found that approximately 2/5 of all faculty time was given over to research; the ratio was nearer 3/5 for science faculty staff. Robbins assessed staff research in British medical faculties at approximately 3/5 of all faculty time, although, the ratio conflicted somewhat with the findings of a U.G.C. enquiry in 1959/60, which put the ratio at closer to ½ of all faculty time. Robbins commented on the discrepancy, and did concede that the estimate of 3/5 "may be slightly too high, since it does not allow for the fact that teaching in clinical medicine goes on throughout most of the year"(2) (see Table 5).

Table 9 gives an indication of the ratios of research workers in British medical schools, expressed as percentages of all staffs in medical schools' divisions. The numbers of research workers have been obtained from the publication "Scientific Research in British Universities" (1951/52 & 1962/63), by using a similar counting and classification procedure to that described earlier to obtain numbers of all medical school staffs. Percentage-wise, the largest amount of research is undertaken in the London schools; it almost doubles the percentage ratios of the English Provinces and Scotland.(3) On the whole, the London medical schools are smaller than the English Provincial and the Scottish schools, and the ratios for some of the London schools' divisions could be innacurate because of small staffs.
Ratios based on division totals are likely to be more accurate.

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1. A Study of Twenty Medical Schools. Public Health Service, National Institutes of Health. April 1959, p.p. 42.
2. Higher Education, Appendix 3, p.p. 66, para. 177.
3. Discussion generally based on the summary division ratios.

Even allowing for some disparity however, it is obvious that there is a considerable emphasis on research in the London schools, shown by ratios which in several instances exceed 100%; that is, a greater number of research staff than teaching staff. One inference is, that some London medical staff take no part in teaching, another, that part-time or other external staff come to the schools to engage on research projects.

Earlier, staff divisional ratios (Table 6) showed a higher proportion of Clinical staff in the London schools than in the English Provinces and Scotland (Clinical : Paraclinical), but it was mentioned that the ratios gave no indication as to whether there was an emphasis in the Clinical division on any one, or a combination, of teaching, research, and patient care functions. With such a high percentage of London Paraclinical staff engaged on research, it is probable that the Clinical staff bias is towards patient care and/ or teaching. Nonetheless, the research percentage ratios for London Clinical staff are still very high by comparison with the Provinces and Scotland; they are indicative of a high reputation attained in past years.

On the future of research, Robbins states: "...there is a vital relationship between teaching and research .... the further development of research institutes unduly divorced from the universities would not serve the cause of research and would impoverish the strength of the universities as teaching institutions."(1) If the universities are to be the channels for future research development, it is certain that medical schools will be expected to shoulder a fair share of this responsibility.

1. Higher Education (main report), p.p. 172, para. 526.

Table 10 shows the ratio increases of staff engaged on research in medical schools over the past 11 years. It can be seen that the largest increase has been in the Clinical departments. For the English Provinces and Scotland, staff engaged on Clinical research have more than doubled their numbers; there has been a similar increase for the Scottish Paraclinical division.(1) Overall staff research increases for the English Provinces and Scotland are very similar, and represent an average total increase of approximately 8% from 1951/52 to 1962/63. For the London schools the increase has been somewhat less, undoubtedly due to an already high percentage of staff engaged on research in 1951/52; further increases for the London schools have more than likely been limited by available accommodation.

A "fair share" of medical school responsibility for the future of medical research is difficult to forsee. If the expansion of the past decade is any criterion, then a doubling of staff engaged on research might be expected in the next 10 years. The Robbins Report suggests that there is not likely to be a slackening in the rate of increase; if anything, a more rapid acceleration.

A major question that will have to be answered - and soon - is: can the existing medical schools cope with this anticipated research increase? The future ability of the London schools to maintain research expansion - even with the redevelopment proposed in the publication "A Hospital Plan for England & Wales" - is questionable due to limitations on urban site area. To assume that the existing English Provincial and Scottish medical schools could shoulder the responsibility,

1. Discussion, generally based on the summary division ratios for London, the Provinces, and Scotland.

or even increase their research staffs to give research staff/ academic staff ratios similar to those shown by the London schools, would be dubious reasoning as the London schools are already crowded. Although the Provincial and Scottish schools are, in the main, less restricted for site development than are the London schools, it is doubtful that even with redevelopment, they could cope with the anticipated research increase without sacrificing the other two basic functions of teaching and service. It does seem to suggest that an increase of facilities for medical school research in Great Britain will have to take the form of some new medical schools in the not too distant future.

STUDENTS

THE CURRICULUM:

Until 1957, the aim of the General Medical Council had been the production of "safe doctors"[1]: "....to make a student a safe practitioner on the public, adequate time for that instruction shall be provided before the student is admitted to a Final or Qualifying Examination ..."[2] The appointment,and the subsequent status of the G.M.C. as an authoratitive body has been questioned frequently - not the least by itself - especially in view of the innefectuality of its "powers to compel"[1]. That this appointment, too, represented the beginnings of modern medicine (as stated by some), has been disputed. It is clear, however, that after the 1858 Medical Act, empirical medicine was steadily transmuted to technological medicine, and a

1. Newman C. The Evolution of Medical Education in the nineteenth century.
2. G.M.C. Recommendations as to the Medical Curriculum, 1947, p.p. 13, para. 32.

doctor of dubious "culture" made way for one who if not brilliant in his profession was at least not "dangerous". One Victorian and 20th century "safeguard" has been the set examination as evidence of a student's ability in his chosen profession.

The medical curriculum, as laid down in 1867, was no doubt adequate to cover the range of medical knowledge at the time, but unfortunately, this early sufficiency became progressively undermined by accretion in the interests of "safe" coverage by the medical student who in turn was becoming less and less able to absorb all of the requisite information. The G.M.C. rightfully claimed that the curriculum was not intended to prescribe uniformity, but unfortunately,G.M.C. intentions were misconstrued, and Recommendations designed to "indicate the minimum standards of instruction"(1) were read as "rules", serving to discourage medical schools from departing too far from the tried and accepted.

The divisions of British medical practice are broadly general and special (with its many sub-specialties). To propound a curriculum biased on one aspect at the expense of the other would seem to render the medical course unbalanced; however, the 1947 and earlier G.M.C. Recommendations had a decided leaning towards general practice.

As if to rebut accusations of former intransigence, the G.M.C. gave positive indications of a policy change in 1957, and the "safe" curriculum was replaced by one which reflected a more liberal outlook. The Council's aim in compounding the new curriculum had been to establish a common denominator in the medical course; it wished to provide a basic fund of knowledge in the undergraduate years from which,

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1. G.M.C. Recommendations as to the Medical Curriculum, 1957, p.p. 5.

and upon which, the future doctor could draw and build. The 1957 Recommendations have provided a denominator and a framework for a medical course. There are several ways of building on the framework, but the G.M.C. has eschewed prescription as to what methods are to be adopted. The onus is placed on British medical schools to provide a fabric.

BASIC AIMS, AND THE SIGNIFICANCE OF THE REVISED CURRICULUM IN 1957:

The undergraduate curriculum should consist of a basic fund of medical knowledge from which the practitioner can draw after qualification.

Medical education is a never-ending process, and as such, the emphasis in the undergraduate curriculum should be on how to learn, not on how much can be learnt - the medical course is only the beginning of the learning process, not the end.

There is likely to be a greater integration of medical school subjects and divisions, for example, anatomy and physiology, Preclinical with"Clinical". This integration must also influence medical school planning, and the relationships of medical school departments.

The courses of most schools are being revised in one way or another. In Britain, revised curricula experiments are still too much in their infancy to draw conclusions, although,some schools have taken steps at evaluating their procedures. Many American medical schools have been operating experimental courses for a longer period and medical school accommodation has often been planned in consideration of these curricula requirements. Variations in American school experiments (educationally and architecturally) are proving of interest, and some of these will be discussed in Chapter 4.

As an encouragement to self-education, the amount of free or elective time in the courses of medical schools will probably be increased. For the student, self-education finds its outlet in reading and research, and as such, he will require adequate accommodation for private work on these two fundamentals - both the library and the teaching laboratory will be involved.

Over the years, the London hospital medical schools have established a very high reputation for their standards of patient care, research, and student clinical training, given largely by part-time physicians and surgeons. They built up much of this reputation as independent institutions attached to their parent teaching hospital. All of the London medical schools are now corporate members of the University of London and they are subject to the "control" of the final M.B.,B.S. examination of the University (their other examinations are internal). It would seem, from this, that the London schools will be less well placed to make radical curricula changes than will be the medical schools in the English Provinces and Scotland which are autonomous in this regard.

STUDENT NUMBERS:

At the time of Goodenough, the range of medical school sizes was considerable; for instance, Edinburgh and Glasgow had student admission rates around the 200 per annum mark, and the range of Clinical experience was very limited in such overcrowded institutions. British medical schools still vary in their sizes and in their rates of annual student admission, but these sizes and rates are now more stable, and generally in keeping with Goodenough's recommendations.

Appendix 5 gives the numbers of student admissions to British medical schools in 1961/62. Based on these numbers, the following are the average annual admission rates to the British **medical schools:** English Provincial 93, Scotland 107, and London 76. American medical schools have an average annual admission rate of 100 students.[1]

The concensus of opinion around 1957 (Willink) was, that medical student numbers should be decreased by 10%. Later discussion and general disapproval at the reducation (notably, a paper by **Laffite** and Squire,[2] and, serious deficiencies in the junior hospital grades as shown by Platt) were instrumental in an official repeal and a restoration of the "lost" 10%. Several medical schools have already made good the number. In the post-war period, medicine is the only British faculty to have reduced its student numbers. Figure 6 shows the general rate of this decrease from 1948 onwards; the accompanying Table 11 indicates the steady decline of the medical faculty as a percentage of all university faculties. From Fig. 6, it might appear that the student reduction rate, which has been fairly constant since just after the war, is now nearing the bottom of a trough, and, that it might be expected to rise once again.

The future medical student population of Great Britain is uncertain. The view that there should be an overall student increase is one which is not held by all. There are, however, a number of factors which tend to suggest that it could be a correct one; for example, there is still a shortage of junior hospital staff (Platt), the rate of expansion of medical school research staff numbers shows no evidence of slowing down, Britain's rate of natural population development is much in excess of predictions around the time of Goodenough

1. U.S. Department of Health, Education, and Welfare. Medical School Facilities, p.p. 2 (admission figures for schools providing the full 4 year course).
2. Laffite F. and Squire J.R. Lancet, 3rd September, 1960.

FIGURE 6. Graph of decline in medical student numbers, in British medical schools, 1948 - 1961. Source: U.G.C. Returns, 1948/49 - 1961/62 inclusive.

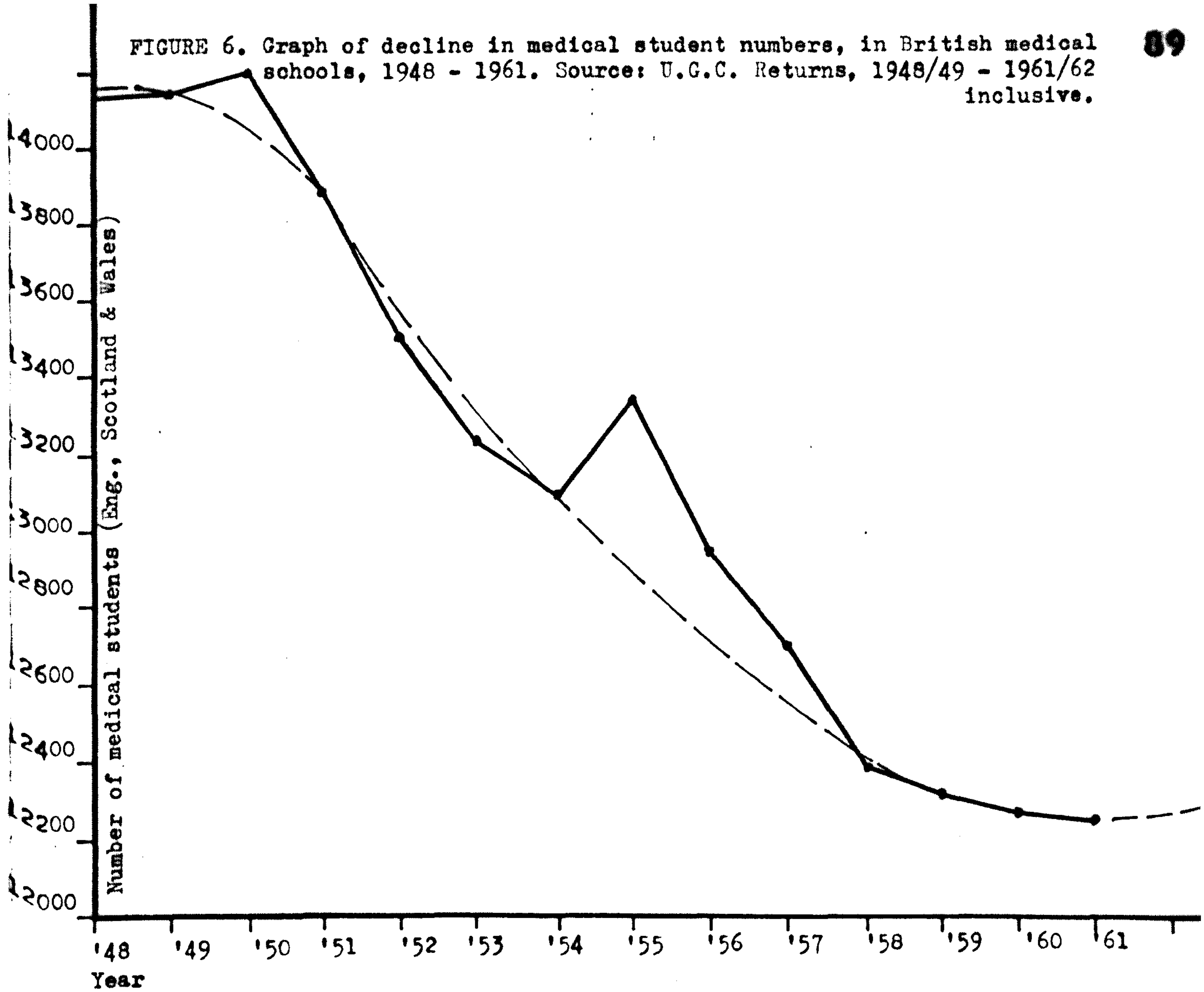

TABLE 11. Decline of medical (and dental) students in British universities, as a percentage of all university students, 1949 - 1961.
Source: U.G.C. Returns, 1949/50 - 1961/62 inclusive.

1949/50	19.8%
'50/51	20.1
'51/52	20.1
'52/52	19.9
'53/54	19.6
'54/55	19.2
'55/56	18.8
'56/57	17.4
'57/58	16.3
'58/59	15.3
'59/60	14.8
'60/61	14.3
'61/62	13.5%

(the Committee did not consider that new medical schools would be required at that time). Even the Robbins Committee was somewhat hesitant at making a prediction. Based on figures supplied by the U.G.C.,Robbins[1] put the number of university medical students in Britain at 21,000 by 1980/81; this number represents an increase of 23.5% over the present total of 17,000, or an approximate increase of 1.3% per annum over the next 18 years.

On the assumption that the medical student body of this country will expand in the coming years, it does not seem likely - once all of the medical schools have attained the latest increase of 10% - that they can be expected to increase their individual student bodies still further without a falling off in standards. One of the primary reasons for post-war reductions has been due to inadequate accommodation, and present medical school accommodation is not much altered from that before the War. If,therefore, any sizable student expansion is to occur in this country (likewise research):

1. Practically all medical schools will have to be rebuilt,or otherwise substantially redeveloped. Their teaching efficiency (and size) will be generally governed by the number of teaching hospital beds available for "Clinical" students.[2] On this premise, medical student intakes to the present foundations cannot be expected to increase greatly unless there is to be a revision on present attitudes concerning the desirable number of teaching beds/ student. It does not seem likely.

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1. Higher Education (main report), p.p. 166.
2. Proposals in the publication "A Hospital Plan for England & Wales" indicate that, after redistribution and consolidation of the present foundations, teaching hospital beds in 1975 are not to be greatly increased over their present number.

2. The supplementary alternative will be to erect new medical schools. Location of these institutions is uncertain, but it is likely that they will be founded in regard to the needs of population. The number of new medical schools is likewise uncertain, but they will have to meet the future demand for doctors.

STUDENT RATIOS:

U.G.C. Annual Returns give the student totals for British medical schools, but they do not differentiate between Preclinical and "Clinical" students. For purposes of the following studies on various student ratios, it has been found necessary to obtain such a breakdown. U.G.C. Returns do give the numbers of medical students attaining degrees. These numbers (1961/62) have been used to obtain the totals for "Clinical" medical students in the British medical schools (number of graduates multiplied by three). "Clinical" student totals determined by this method have then been subtracted from medical student totals listed in U.G.C. returns (1961/62) to give the number of Preclinical students (see Appendix 5). It is probable that calculated "Clinical" totals will be less than the actual numbers of "Clinical" students, for example, some students fail in the final year, others may not complete the course for one reason or another. Correspondingly, calculated Preclinical totals will probably exceed the actual Preclinical student totals. It is not considered that discrepancies between calculated and actual school totals will greatly prejudice the accuracy of the following ratios, which are intended primarily for proportional comparisons between schools.

MALE/ FEMALE STUDENT RATIOS (Table 16 - Part 3)[1]

The English Provinces provide the most favourable ratio for women (2.4 : 1). The figure for the London schools is about 3 : 1, although,this would be closer to 5 : 1 but for the large number of women students at the Royal Free medical school. Before the War, this school admitted only women students; as the student numbers in Appendix 5 show, the ratio in favour of women students is approximately 5 : 1, and they make up over $\frac{1}{3}$ of the total for London.

STUDENTS/ STAFF:

Table 1 gives a medical student/ academic staff ratio of 5.6 : 1[2] for the British medical schools in the year 1961/62. A more detailed analysis is provided in Table 12 (based on all medical school). Neither table, as mentioned earlier, gives any indication of how much teaching and research staff are actually engaged upon; reference should be made to Tables 2, 3, 4, & 5, for this information.

Preclinical student/ staff ratios for the English Provinces are decidedly lower than are those of London and Scotland. "Clinical" student/ staff ratios are all closer, although the English Provinces again show more favourable ratios, with approximately one "Clinical" staff member for each undergraduate student(summary ratios). The difference that is so apparent between the Preclinical and "Clinical" ratios of all British schools is partly indicative of the different teaching procedures in the Preclinical and the "Clinical" years (especially in the Clinical (only) division). There is also a very small

1. Discussion is based on summary division ratios for London, the Provinces, and Scotland.
2. For undergraduates.

TABLE 12 Ratios of medical students to all staff - by division, 1961/62. Source: Appendices 3 & 5.

	"Clinical" Students	: Staff	Preclinical Students	: Staff
Birmingham	0.9	: 1	1.2	: 1
Bristol	0.7		1.6	
Newcastle	1.4		7.3	
Leeds	1.0		6.4	
Liverpool	1.3		12.5	
Manchester	1.0		5.8	
Sheffield	0.7		2.3	
Wales	1.2		2.0	
	1.0	: 1	3.1	: 1
Aberdeen	1.0		27.9	
Edinburgh	1.4		7.6	
Glasgow	1.8		11.5	
St.Andrews	1.0		8.9	
	1.3	: 1	10.2	: 1
Charing Cross	2.6		5.8	
Guy's	3.7		20.6	
King's College	2.5		-	
London	2.6		23.6	
Middlesex	3.5		14.1	
Royal Free	3.1		14.4	
St.Bart's	4.4		27.0	
St.George's	2.1		-	
St.Mary's	4.0		12.2	
St.Thomas's	2.1		19.6	
U.C.H.	4.7		-	
Westminster	4.9		-	
	3.3	: 1	16.4	: 1

differential between the smallest and largest "Clinical" ratios of all British schools,which contrasts noticably with the range, and variations within the range, of the Preclinical ratios.

No doubt the method of ascertaining student numbers would contribute to the Preclinical variation, but even allowing for a wide margin of error, it is still apparent that there is a much greater variation between the Preclinical divisions of British medical schools than between the "Clinical" divisions (staff numbers and student/ staff ratios). A contributing factor to this difference could be the varying locations of the Preclinical and "Clinical" divisions in British medical schools; in some instances, Preclinical and "Clinical" are both housed in the one medical school building (as a part of the parent teaching hospital), in others the divisions are separated, most commonly, with the "Clinical" division in the teaching hospital and the Preclinical division with the other science faculties at the university.

The U.S. Department of Health, Education, and Welfare made a similar type of comparison for American medical schools, based on the ratio of student admissions to staff.(1) The Department also found a wide disparity in the student/ staff ratios of the medical school divisions, but for the American schools, this tended to be more apparent in the Clinical Sciences than in the Basic Sciences (Preclinical + Paraclinical). The Department estimated that a medical school with a 96 student intake would require a full-time faculty of 50 for the Basic Sciences (2 years), and 85 for the Clinical Sciences (2 years). This would give a student/ staff ratio of

1. Medical School Facilities, planning considerations and architectural guide, p.p. 20, 21, & 22.

3.9 : 1 for the Basic Sciences and 2.3 : 1 for the Clinical Sciences.[1]

A comparison of student/ staff ratios (Table 12) and staff research percentages (Table 9) for the British schools, rather surprisingly, shows a general tendency for schools with high percentages of staff engaged on research to provide less favourable ratios of staff for teaching.

BREAKDOWN OF STUDENT WORKING TIME:

Table 13 gives a breakdown of a student working week (1961/62). Robbins found that the total amount of student working time is greater for medicine than for all other faculties.[2] All but 1½ hours are taken up in lectures and practical work, lectures making up 37% and practicals 56% of the working week.

Robbins noted dissatisfaction by most faculties in Britain at "undue reliance on lectures".[3] The Committee's general impression was that the "tutorial"[4] was considered by university staffs to be a better means of teaching students. In summary, Robbins felt that teaching should be a combination of both methods, although it did feel that "there is little virtue in formal lectures delivered to very small audiences".[5] As applied to medical education, the sentiments suggest that British medical schools will in future make more provision

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1. It should be noted that student/ staff ratios calculated by the author are based on <u>all</u> staff. Ratios for Robbins and the U.S. Department of Health, Education, and Welfare are based on academic staff.
2. Higher Education (main report) p.p. 186.
3. Ibid. p.p. 186
4. "A system that ensures that the pupil comes into personal contact with the teacher" - Main report, p.p. 186
5. Ibid. p.p. 187.

TABLE 13 Average hours of teaching per week (by time and %) received by full-time undergraduate medical students, 1961/62. (Spring Term). Source: Robbins Report, p.p. 186.

	Lectures	Discussion periods attended by 10 or more students	Discussion periods attended by 5 - 9 students	Discussion periods attended by 1 - 4 students	Practicals	Other teaching	All teaching
Breakdown in hours	8.0	0.8	0.3	0.2	12.1	0.2	21.6
Breakdown as a %	37.1	3.7	1.4	0.9	56.0	0.9	100%

TABLE 14 Postgraduates as a percentage of all full-time students (excluding postgraduates studying Education). Source: Robbins Report p.p. 99

	Oxford & Cambridge	London	Larger Civic	Smaller Civic	Wales	Scotland	All universities
Medical Subjects	13	11	4	0	1	6	8

TABLE 15 Type of course of full-time postgraduate medical students 1961/62. Source: Robbins Report, p.p. 103.

	Courses of instruction	Research	Number	Percentage on courses of instruction
Medical subjects	295	195	490	60%
Humanities	500	1110	1610	31%
Social Studies	500	425	925	54%
Science	300	4050	4350	7%
Applied Science	435	1695	2130	20%
All faculties	2030	7475	9505	21%

for small group teaching and discussions, and in this respect, a seminar room would appear to have more to recommend it than a small lecture theatre, although, the large lecture should continue to occupy an important place in the medical school.

The main avenues for lectures and practical work in British medical schools are the lecture theatre and the teaching laboratory. In terms of a 40 hour week lectures take up only 1/5th, and for most of the remaining time lecture theatres (and teaching laboratories to a lesser extent) are unused and are therefore wasteful of space, in servicing, and in operational cost (winter time imposes an additional heating load). Medical school lecture theatres may be used by other persons or bodies for a number of functions, for example conventions and special lectures, although it is doubtful if their potential has been fully exploited in the past. The teaching laboratory is less adaptable for multiple functions. The traditional teaching laboratory is usually an open single room, giving all students an unobstructed view of a teaching podium, demonstration bench, and blackboard; students are seated, or stand, at island benches. Servicing in the teaching laboratory usually precludes its use for any function but that of teaching and practical work.

New attitudes on undergraduate teaching and improved teaching equipment are not likely to diminish problems which arise by virtue of the size of lecture theatres and teaching laboratories, and of their disproportional demands on medical school area. In the interests of economy, there are some possible considerations:

1. There should be a greater sharing of these areas, despite some inconvenience that it might afford a few departments which have endeavoured in the past to retain separate facilities.

2. Centralization: This is an extension of the former, and as summarized under the Goodenough Report, it may be applied to lecture theatres, teaching laboratories, and any other areas, which, because of inflexibility or heavy servicing committments, place abnormal demands on the medical school budget. These remarks are especially cogent for small - medium size schools.

3. For teaching laboratories, there could be some system of adaptability whereby they may be used for small group teaching and/or the instruction of a large class.

POSTGRADUATES AND OTHER STUDENTS:

The primary teaching responsibility of a medical school is the instruction of its undergraduate medical students. Medical schools do, however, teach a number other students and depending on the particular school, these may include postgraduate, dental, science, agriculture, and any other student body whose subjects are allied to those of the medical course. Medical undergraduates themselves may undertake to do special courses.

Dental students share many common teaching interests with medical students, and,if the medical and dental schools are sited close to one another, it is possible to provide accommodation that can be shared by both faculties. The number of faculties utilizing medical school facilities (other than medicine) varies considerably in this country; siting of the teaching hospital in relation to the university is the relevant factor.

In order of precedence, postgraduate medical teaching closely follows that of undergraduate medical teaching irrespective of any other undergraduate faculty commitments. "Postgraduate" can mean: students who are doing an actual course for a higher degree or qualification, or members of the teaching hospital medical staff (registrars, house officers, etc.) serving in the hospital grades and aspiring ultimately to a consultant post, or others from outside the teaching hospital who are engaged on refresher courses or on subjects in which they have a special interest. "Postgraduate" in this thesis will normally apply to academic students.

From Table 14, postgraduate medical students can be seen to make up 8% of the full-time medical student body in Britain. This figure is the smallest for all faculties, and it is less than half of that for the other sciences. Oxford & Cambridge and London show the largest number of medical postgraduates (in total and by percentage).

Medical postgraduates have increased since the war at a rate, as shown by Table 1, exactly proportional to the increase of postgraduate teaching staff. The staff/ postgraduate student ratio for medicine reveals a generous distribution of teachers to postgraduates, although, as suggested by the staff/ undergraduate ratios of 1938/39 and 1961/62 (same table), the present favourable ratio for postgraduates has probably been due to the necessity for a radical build up, in the 23 year period, of medical staff for undergraduate teaching. The 1961/62 number of medical postgraduates (Table 15) is much the smallest for all faculties,[1] and it is likely that the necessity to increase medical school staff in the post-war period has been at the expense of postgraduate medical student expansion.

Table 15 gives the present number of postgraduates engaged on instruction and research. It can be seen that, by comparison with the other faculties, postgraduate medicine has an extremely high percentage of students under instruction, or alternatively, a very low percentage of postgraduates engaged on research (medicine 40%, science 93%, applied science 80%). The amount of medical school area required for instruction is considerably less than that required for research, and in support of the remarks in the previous paragraph, the development of postgraduate medical research in British medical schools since the war has probably been retarded by inadequate accommodation.

In an age of science, it is to be hoped that postgraduate medical students in undergraduate medical schools will be enabled to show a marked increase over their present number, and especially postgraduates engaged on research, in order to bring them more into line with other faculties, and the sciences in particular. To this, should also be coupled the necessity for greatly improved postgraduate research facilities.

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1. 5.2% of all postgraduates.

PART 3: CLINICAL DEPARTMENTS: SERVICE AND TEACHING ASPECTS

Traditional student apprenticeship is still very much a part of British medical education, and finds its outlet in the work of the "firm" ("clinique" in Scotland). The firm system has become almost an indispensable part of undergraduate Clinical teaching, forming at the same time, an integral part of the operational structure of the teaching hospital. It is not restricted to these institutions, for it has been adopted by some non-teaching hospitals Similar systems have been tried in other countries but only with limited success. Of significance - as suggested in the publication "A Hospiatl Plan for England & Wales" - the basic character of British Clinical teaching by firm apprenticeship is to continue, albeit, modified in the face of changing conditions.

A teaching hospital may be comprised of teaching and non-teaching firms. Their staffing structure is important, and much of the success of British medical teaching has been due to the compactness of these small, relatively autonomous units. The medical student/ staff ratio in this country is approximately 5.6 : 1 (Table 1); the actual ratio for medical undergraduates in Clinical firms would be much less than this figure, as suggested by the ratios in Table 12.

A teaching firm can be responsible for up to 50 patients but it does not encroach on the patient responsibilities of other units, either teaching or non-teaching. Staff members usually work in pairs - one senior/ one junior - and at the end of one grade, within the limits of selection, members go into the next grade; seniority in this respect is usually based on the length of service. Because of an increased responsibility for medical research and the teaching of medical students, teaching units have generally been favoured with larger staffs and better equipment.

Although still far from being universal, many teaching firms now constitute "professorial" teaching units, with a university professor at the head. Other smaller departments come under a director who is normally a university reader or senior lecturer. Smaller specialties, not of sufficient size to warrant a complete unit, may have one or two specialist teachers who are responsible for instruction on the subject. Professorial departments are to be found in all divisions of a medical school.

The teaching unit is made up of some staff (senior) appointed by the university, plus, a larger number (usually) who belong to the parent teaching hospital - some of these are also recognised by the university. The number of staff, and their nomenclature, varies considerably in different medical schools. There is, also, no uniform system whereby university posts may be equated with those of the hospital grades. In terms of teaching grades, teaching units are made up of consultants, registrars, house officers, students, and nursing staff. Hospital grade commitments, and the general relationships of hospital grades and academic teaching posts, are as follows:

Consultants:

As part of a unique British "referral" system, consultants see only those patients who are recommended to them; they are permitted to take some private patients. Non-teaching consultants retain the fees from private patients; university consultants' fees go into the medical schools' research funds.

The teaching firm is headed by a "chief" consultant, who is helped by an assistant (a reader or a senior lecturer). The "chief" of a professorial teaching unit is employed directly by the university, and, he is normally appointed as an honorary consultant to the teaching hospital; this also applies to other academic consultants. He is responsible for supervising patient care, research, and the teaching commitments of his unit, and, as a senior member of the hospital staff, he is expected to voice an opinion in hospital affairs and in the selection of other senior medical staff.

Registrars: There are two groups:

1. Senior registrars (senior lecturers or lecturers); Endeavours to build up specialist staffing in the early years of the N.H.S. were responsible for creating an undesirable imbalance of an excess of senior registrars applying for a very limited number of available consultancy posts. The Ministry of Health has undertaken steps to rectify the inadequacies, and at present, supply and demand in the senior grades has become more stable. The minimum length of service in the senior registrar grade is 4 years (there is no maximum). The senior registrar is personally responsible for patients; he supervises case records, and is usually the first to be called in emergencies. Individual research is an important aspect of his work, and it may include a dissertation for a postgraduate degree (M.D.,or M.S., etc.). He also conducts ward rounds, and teaches by discussion and demonstration.

2. Registrars (ordinary): Nationalization realized a similar demand for more ordinary registrars, because the limited experience of house officers was not considered to be sufficient for the requirements of the N.H.S. The registrar begins his special training by serving as an assistant to a senior registrar; he takes case notes, he undertakes preliminary research under supervision (usually in a research group), and he generally assists in the supervision and the teaching of housemen.

House Officers: There are three groups:

1. Preregistration house officers: The minimum period of tenure is 12 months, and it must precede all forms of medical practice, that is, general and special. As students only recently graduated, their work is of necessity general, served in medicine, surgery, casualty, and sometimes in paediatrics.

2 & 3. Fully registered and senior house officers: The aims and general duties of the two grades are similar to the preregistration year. They differ, in that they do not constitute compulsory periods of training for general practice. They are compulsory periods of service if the newly qualified practitioner wishes to remain in the hospital service.

Students:

After the Introductory Clinical period, undergraduate students (about 6 - 8 in number) are attached to one of the hospital firm teaching units for a normal period of 3 months; as clerks, if it is a medical firm, or as a dressers in a surgical firm. At the completion of one apprenticeship, the student changes to another firm - medical to surgical, or vice-versa. He gains similar clerk and dresser experience in the other medical and surgical specialties, but they are usually of a lesser period. Apprenticeship also extends to the o.p.d. and the casualty departments of the teaching hospital.

The student is responsible for writing up ward reports of patients allotted by the registrar, and he is expected to be in attendance during the ward rounds by his chief and the registrar. He gains practical laboratory experience in laboratories on the ward where provision is also made for seminar/ tutorial discussions. Clinical apprenticeships are supplemented and interspersed by formal and practical work in the Paraclinical departments.

BEDS/ STUDENT RATIOS:

In the interests of providing a wide undergraduate Clinical experience, it might be expected that within reasonable limits, the larger the number of teaching beds, the more adequate will be this experience. The publication "A Hospital Plan for England & Wales" has intimated that the size and the location of a teaching hospital should be governed by its ability to provide Clinical teaching facilities. It is not certain from this, whether the desirable number of medical students to be taught should determine the number of teaching beds, or, whether the number of beds available should govern the size of the student body. Britain's Clinical service tradition suggests that the latter may be the case.

In America, "for the 42 schools with university or medical school hospitals in full operation"[1], the ratio of teaching beds/ student for the parent hospital (only) is 3 : 1, for the teaching hospital group it is 4 : 1. The majority of the 42 American parent teaching hospitals are within the range 2.0 - 3.9 : 1.

Table 16 gives a comparison of the ratios of beds/ medical student in English teaching hospitals. Wales has been disregarded from the table; there are some 25 hospitals in the teaching hospital group providing 3419 beds in all, with a beds/ student ratio of 23.8 : 1. A new 800 bed parent hospital is proposed in Cardiff. The English Provincial teaching hospitals show beds/ student ratios for both teaching hospital groups and parent hospitals (only) which are a little better than are those of the London teaching hospitals.[2] The beds/student ratios for parent hospitals (only) in London and the Provinces are generally similar to those shown by the American schools above. The ratios for teaching hospital groups, however, show a more liberal provision in the English teaching hospitals, and suggest a greater English emphasis on Clinical apprenticeship teaching than is the case in the American medical schools.

In a recent publication,[3] Peter Cowan compared the numbers of teaching hospital groups in London and in the Provinces.[4] He noted that "the Provinces ... contain a much larger number of both hospitals and beds" and concluded that Provincial teaching hospitals "seem capable

1. U.S. Department of Health, Education, and Welfare. Medical School Facilities, p.p. 10.
2. Discussion is based on summary ratios for London and the Provinces.
3. Medical Care, Jan-March 1963, Vol.1., Number 1.
4. Cowan's source was "A Hospital Plan for England & Wales" (1961).

TABLE 16 Ratios - teaching hospital beds/ medical student; male/ female students. Source: Appendices 4 & 28.

	Beds/ Student		Male/ Female
	Teaching Hospital group	Parent teaching hospit 1	
Birmingham	6.6 : 1	2.6 : 1	2.8 : 1
Bristol	6.1	2.4	2.1
Newcastle	4.0	3.0	3.0
Leeds	6.8	5.5	2.1
Liverpool	8.3	1.7	2.9
Manchester	5.7	3.8	2.1
Sheffield	11.2	4.3	2.1
Wales	Discounted		2.0
	6.7 : 1	3.2 : 1	2.4 : 1
Aberdeen			2.8
Edinburgh			3.7
Glasgow			2.8
St.Andrews			2.8
			2.8 : 1
Charing Cross	7.6	2.5	4.3
Guy's	3.8	3.8	5.7
King's College	3.4	3.4	5.1
London	7.2	7.2	4.9
Middlesex	6.4	5.1	4.6
Royal Free	6.3	1.7	0.2
St.Bart's.	4.2	4.2	4.1
St.George's	3.1	2.4	5.4
St.Mary's	4.1	2.5	3.5
St.Thomas's	6.5	4.7	5.6
U.C.H.	4.4	2.8	4.6
Westminster	4.4	2.1	5.3
	4.9 : 1	3.5 : 1	3.1 (4.7 : 1 if Royal Free discounted)

of providing a wider range of teaching material, together with a better service to the community".[1] Beds/ student ratios for teaching hospital groups in Table 16 tend to bear this out.

If British medical student numbers increase to the 1980/81 total, as forseen by Robbins,[2] the numbers of available beds in teaching hospitals in 1975 ,as indicated in the publication "A Hospital Plan for England & Wales", seem liable of providing a smaller range of Clinical experience than at the present time. It is doubtful if this would be considered desirable by medical educators in this country, and it is a further indication that new teaching hospitals will probably be required.

From "A Hospital Plan for England & Wales", it is interesting to note that associated teaching hospitals in 1975 will tend to form more compact groups than is presently the case, and the tendency is again in keeping with a Goodenough recommendation.

RECENT DEVELOPMENTS IN CLINICAL TEACHING

The ideal of the teaching unit is that of a small number of consultants and consultant trainees under a chief, all having (in addition to normal patient responsibilities) a generous time allocation for teaching and research. It is doubtful if the ideal has ever been achieved, but, in varying degrees, it has proved itself to be the most suitable for patient care and for Clinical teaching in this country. Developments in medical science and an increase in the number of medical specialties are tending to render the firm ideal ideal less effective. There is a certain conflict between the interests

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1. Medical Care, Jan-March 1963, Vol.1., Number 1, p.p. 7.
2. Higher Education (main report), p.p. 166.

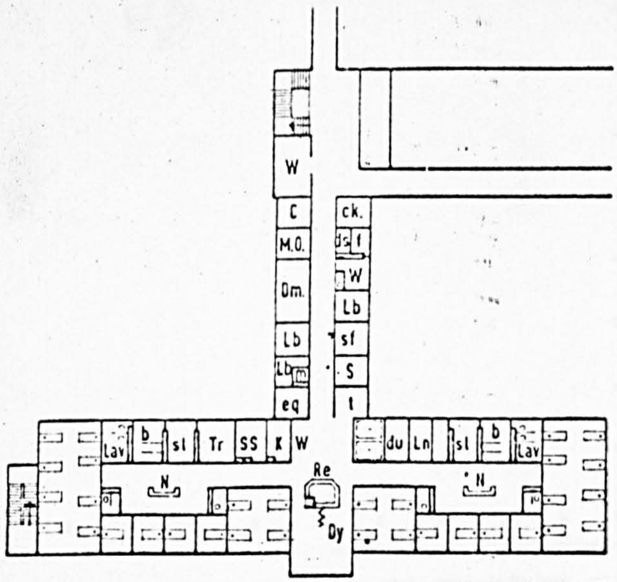
of the 3 primary teaching hospital functions - teaching, research, and service. In connection with research, it would seem imprudent to impede its development in this rapidly expanding scientific age; therefore, it has been found necessary to broach new alternatives for the teaching and service functions. A number of approaches have been tried in British teaching hospitals; some of these, in respect of teaching, are as follows:

The teaching units of some schools are endeavouring to elevate the status of the medical student (a) by attaching greater significance to students' casenotes (some schools have, in fact, made these the only hospital record), and (b) by increasing the importance of the students' work in the laboratory.

Teaching on the traditional ward round is being superceded by patient teaching in a room adjoining the ward. Here, the patient is wheeled for demonstration and teaching; later he is removed before "case" discussion takes place. The move has a number of advantages, for example, students do not have to congregate around a ward bed where space is usually limited, patients experience less of the "guinea-pig" complex by not being present at case discussions, the ward teaching room facilitates student participation in case discussions, it has a seminar/ tutorial character and makes for a closer unity of student and teacher, other senior staff (external, internal, postgraduates, etc.) are able to join in discussions.

From the brief survey of American medical education in Chapter 4, it is evident that certain of the measures in regard to overspecialization have been operating for some years, for example, the "Clinic" system of undergraduate teaching operating at the Western Reserve medical school - students are introduced to patients right from their first years at medical school, in some American medical schools an increasing emphasis is being placed on the o.p.d. as a medium for student participation and experience. In this country, the proposed teaching hospital at Ninewells, Dundee, will also utilize more fully the teaching potential of the o.p.d. ("polyclinic") than has formerly been the custom.

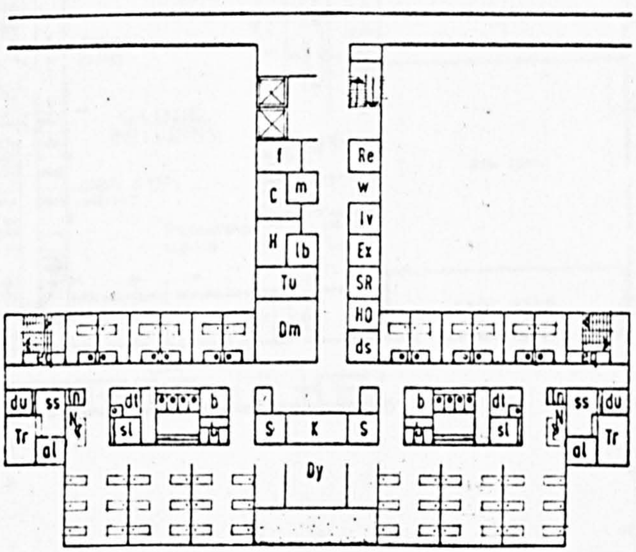
FIGURE 7.



[Scale: $\frac{1}{64}$" = 1' 0"]

a. WELSH NATIONAL SCHOOL OF MEDICINE typical ward unit

- "T-plan"unit
- 32 beds - 8 single, 2/ four bed, 8/ single bed.
- teaching rounds are superceded by teaching in a demonstration room on the ward - in the stem of the "T"



[Scale: $\frac{1}{64}$" = 1' 0"]

b. UNIVERSITY OF ST.ANDREWS typical ward unit

- "T-plan" unit
- 48 beds - 12 single, the remainder in six bed open bays
- teaching rounds are superceded by teaching in a demonstration room and a tutorial room on the ward

List of abbreviations used on ward plans

al	airlock
b	bathroom
C	consultant
ck	cloakroom
Dm	demonstration
ds	domestic service room
dt	dirty treatment room
du	dirty utility
Dy	day space
eq	equipment room
Ex	examination room
f	female lavatories
H	head of unit (professor or clinical chief)
HO	house officer
Iv	interview room
K	kitchen
Lav	lavatories
Lb	Laboratory
Ln	linen store
m	male lavatories
MO	medical officer
N	nurses' station
Re	reception
S	sister
sf	staff room: rest room
sl.	sluice room
SR	senior registrar
SS	sterile supply store
Stu	students' room
t	trolley park
Tr	treatment
Tu	tutorial
Ut	utility
V	visitors
W	waiting area

Source: Architects' Journal, August 16, 1961

FIGURE 8.

THIRD FLOOR PLAN - STANFORD MEDICAL CENTRE

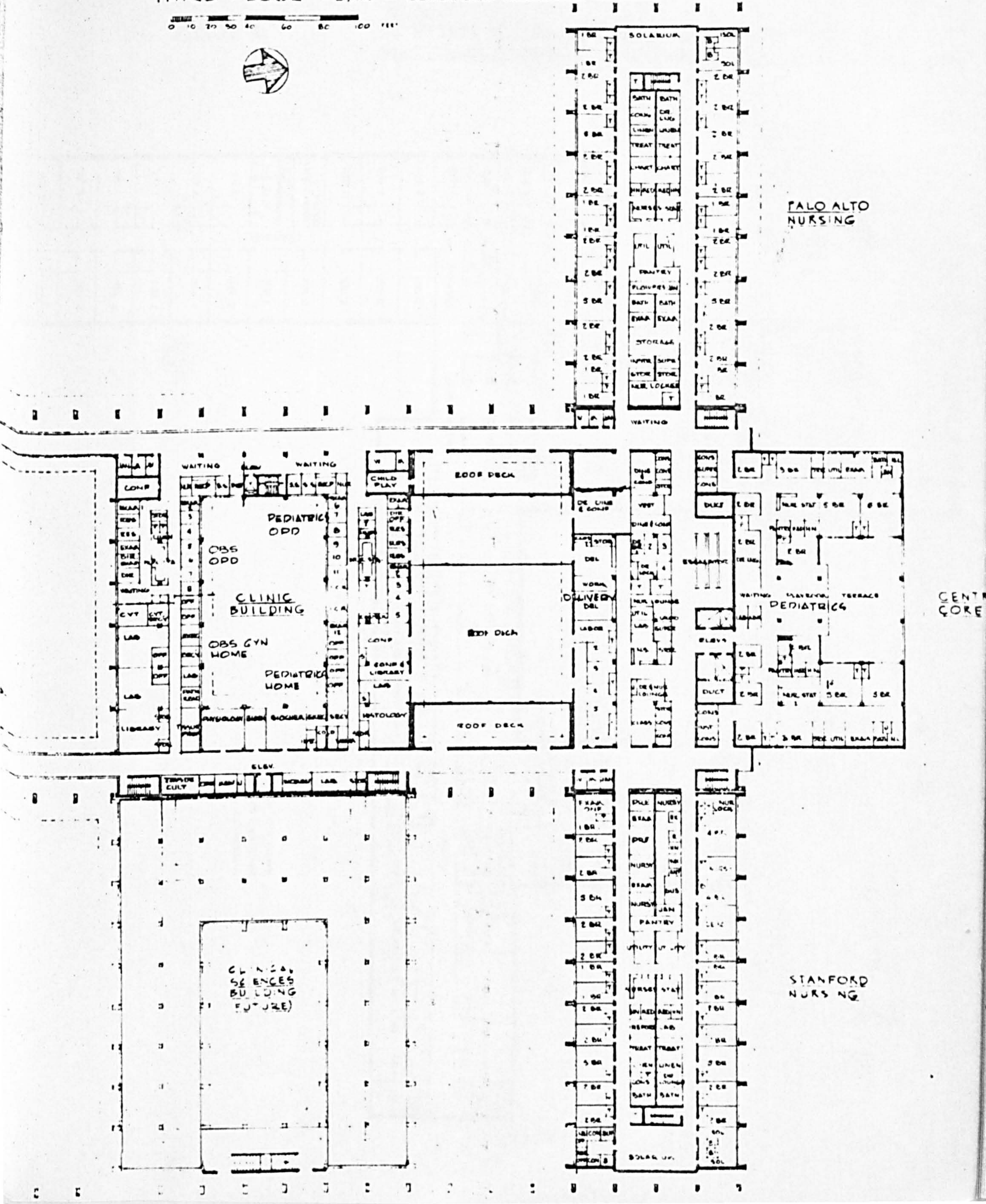
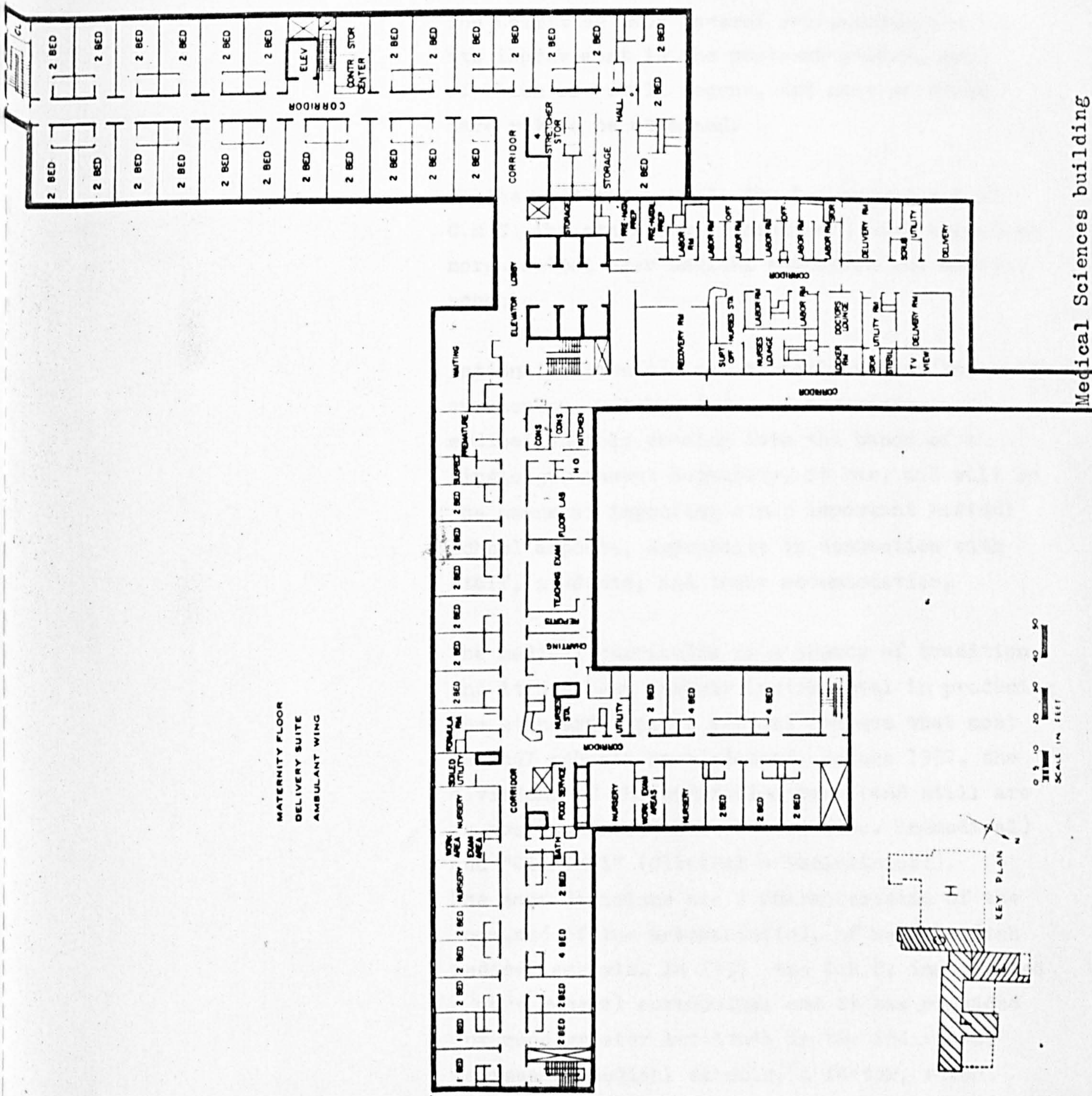


FIGURE 9. J. HILLIS MILLER HEALTH CENTRE, UNIVERSITY OF FLORIDA-GAINESVILLE. Teaching hospital - 3rd fl. plan



SUMMARY CONCLUSIONS

The Goodenough Report pointed up many prewar inadequacies in British medical education. The Committee made several recommendations for its improvement in the post-war period, most of which are still cogent, and many of which have yet to be attained.

In the post-war period, the Government and the G.M.C. (by statutory appointment) have exercised more control over medical education and medical schools.

Nationalization did not directly affect the medical curriculum, but by virtue of the control of medical schools passing into the hands of a single government authority, it has, and will be the means of improving other important medical school aspects, especially in connection with staff, students, and their accommodation.

The medical curriculum is a legacy of tradition, and it has been largely instrumental in producing the standard type of medical courses that most medical schools have adopted. Before 1957, the divisions of the curriculum were (and still are in most schools): Preclinical (inc. Premedical) and "Clinical" (Clinical + Paraclinical).
The same divisions are a characteristic of the form,and of the accommodation, of many British medical schools. In 1957 the G.M.C. inaugurated a more general curriculum, and it has provided for much greater lattitude in the individual courses of medical schools, a factor, which is also likely to influence the future planning of medical schools.

The basic functions of a medical school are teaching, research, and service.

Research by medical school staff is a vital aspect of medical operations. Staff engaged on research have almost doubled their number in the past decade (Clinical staff have,in fact, done so), and are likely of doing the same in the next. The architectural implication of this research development calls for: (1) a grouping of research laboratories for economy, (2) reasonable internal flexibility of research areas, and (3) the ability of these areas to expand ("open-ended planning").

The critical shortage of prewar medical staff has been alleviated. The present student/ academic staff ratio is 5.6 : 1. This ratio can still be improved (especially for Preclinical students), but the improvement will probably come as a result of more staff being engaged on research. Undergraduate student numbers in medical schools are seen as being reasonably stable in the future (around a maximum intake of 100 per annum). The availability of teaching hospital beds is a limiting factor on the number of students in a medical school; for British teaching hospitals, the ratios of beds/ student are presently in the vicinity of 6 : 1 for a teaching hospital group, and 3 : 1 for a parent hospital. The present ratio of male/ female medical students is around 3.0 : 1.

Teaching hospital accommodation will need to be increased and vastly improved. In a new medical school, a great expansion of teaching areas is not generally forseen after their initial provision. Traditional lecture theatres and teaching laboratories are uneconomical in the cost of their provision and in their operation; there will have to be much greater consideration given to the possibility of these facilities being shared, centralized, and more adaptable for multiple functions. In the interests of efficiency, convenience, and economy, the policy of sharing and centralization could also be extended to the library, the animal house, museums, stores, workshops, staff and student amenities, and any other accommodation which is commonly used by Clinical, Paraclinical, and Preclinical departments.

Inadequate accommodation has hampered postgraduate medical student expansion in the post-war period. There should be an immediate increase in the number of postgraduate medical students, and especially, of those students engaged on research. More accommodation will be required for postgraduate research.

The present complement of medical schools in this country does not appear to be capable of accommodating the future national demand for increased university research, much less, a possible medical student expansion. New medical schools will be required.

Traditional British Clinical apprenticeship in the "firm" will continue, albeit, modified in the face of changing conditions.

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ARCHITECTURAL STUDY 3.

SCOPE

From the previous survey of medical education and medical schools - past and present - it is apparent that there is an opportunity for improvement in practically all spheres connected with medical students and their education. Some progress has been made in this direction along the line of the previously mentioned curriculum, and medical schools in this country are attempting,by various means, to meet the challenge offered by the G.M.C. The task in a number of instances is a sizable one. Architecturally the problem is not less monumental, indeed, it is perhaps more so in that new attitudes on medical education and a rapid expansion in research have required that architects almost completely rethink approaches to the planning and the design of medical school buildings, the existing ones having long become redundant. They can hardly be expected to serve as a basis for present and future developments. It has become essential, therefore, to establish new criteria for such development.

The subject "University Medical Schools" is a wide one and it would be virtually impossible to encompass all, or even a large part, of the various architectural facets in this thesis. For this reason, it is felt that a more valuable contribution can be made by restricting the subject matter of original investigation to a narrow field, and by concentrating this on one main aspect - a study by area, with special reference to teaching and research laboratories. It is possible that a number of smaller studies may accrue; two such - staff and student density ratios - are examined in this chapter. Elsewhere, suggestions are proffered where it is thought that further avenues of investigation are feasible.

Investigation throughout this thesis is of three kinds:

1. The collection of general material which is existing, but, which has required collation relative to the subject.

2. The collection and the summarization of data which has been prepared by other authors.

3. The compilation of data, mostly taken from the schedules of accommodation of a number of proposed medical schools, and its tabulation in an order from which an assessment and conclusions might be drawn.

1 & 2 apply generally throughout this thesis. Much of the work in connection with 3 is original (although it is not exclusively so), and it is discussed in this chapter as the main part of the author's contribution to the subject "University Medical Schools".

INTRODUCTION

A question which is inevitably posed at the instigation of a programme for a new medical school is "what size should it be?" There are one or two general methods of expressing the size of a teaching hospital, one such, being in terms of the available number of teaching beds/ medical student. Of the medical school itself, there have also been definitions of its size in terms of the student annual intake, and of the number of students that it houses.

These and other considerations are essential, and they are very useful to the architect, but none of them provides him with specific information on the actual size of the medical school's departments and other essential facilities. In a government publication,(1) the U.G.C. has set down a number of suggested areas for university science buildings (including medical schools) as a preliminary planning guide, and in connection with the submission of schemes for Non-Recurrent Grants (see Appendix 6 for suggested scales of accommodation). The information contained in this publication is useful, but it only briefly encompasses medical schools. A more specific document has been published by the U.S. Department of Health, Education, and Welfare,(2) which refers specifically to the design of medical schools; it is an extremely informative publication and parts of it will be discussed in this chapter. Much of this information is universal, but it cannot be expected to comply with the parochial requirements of all countries, and Britain in particular.

1. U.G.C. Notes of Procedure for Non-Recurrent Grants.
2. Medical School Facilities, planning considerations and architectural guide.

Because of the paucity of information on medical schools in this country, it was felt that some form of area study which might form the basis of a comparison between a number of medical schools could be used to produce information from which certain design criteria could be formulated. To the author's knowledge, there has been no such study undertaken in this country, or in any other.

INVESTIGATION PROCEDURE

There were two possible approaches which could have been adopted for the study: (1) a linear/ area measurement of existing medical schools, and (2) an area study based on the schedules of accommodation of existing or proposed medical schools. In the case of the former, plans were not easy to come by, scale measuring is difficult and probably innacurate because of building alterations which have taken place since the plans were first drawn up, nearly all British medical schools are old and are not representative of newer thinking on medical school laboratory design. The latter approach was favoured, therefore, although it too presented a number of problems; for example, the choise of "new" medical schools in this country is limited almost to schools which are in the preliminary design stage; of these schools, the presentation of information in their schedules of accommodation is not uniform, some schools contain all of the medical school departmental subjects which are listed in the G.M.C. curriculum and others the "Clinical" (only) subjects, schedules of accommodation are likely to change before the building is actually completed (or even started).

The following proposed medical schools are to be examined:

The Royal Infirmary, University of Edinburgh.

United Cardiff Hospitals and the Welsh National School of Medicine.

United Sheffield Hospitals and the University of Sheffield.

Eastern Regional Board, University of St.Andrews, Ninewells, Dundee.

University of Newcastle upon Tyne.

A hypothetical medical school published by the U.S. Department of Health, Education, and Welfare.

The preliminary approach to the study was to examine the area structures of all of the medical schools with a view to isolating the basic areas of which they are composed. From earlier discussion, the basic divisions of the British medical course (and medical schools) are Preclinical (inc. Premedical) and "Clinical" (Clinical + Paraclinical). Under these divisional headings go all of the departments which make up the medical school.

Again, as shown previously, the Preclinical division is often physically separated from the "Clinical" division. It gives rise to two types of medical schools:

1. "Clinical": Only the subjects of the "Clinical" curriculum are taught in the parent teaching hospital; the Preclinical subjects are taken in a separate building which is normally a part of the main university - it may be close to the teaching hospital, or it may be at a distance.

2. "Full Curriculum": "Clinical" and Preclinical divisions of the medical school are both housed and taught at the teaching hospital.

As a part of the preliminary survey, it was found that all of the medical schools' departments and/or divisions were capable of breakdown into a number of categories. These categories have been classified under the following headings: Offices, Laboratories, Supplementary Laboratory Accommodation, Ancillary Laboratories, Workshops, Stores, "Miscellaneous" areas, Teaching areas. Some of these categories may be broken down still further, but they were considered to be the most suitable for the type of comparisons used in this section.

Offices: Most of these are clearly stated in the schedules of accommodation. They are all as generally listed for academic staff (professors, lectures, readers, etc.) in the U.G.C.'s publication "Notes on Procedure for Non-Recurrent Grants" (see Appendix 6). In a number of schedules Offices have been itemised as "Office/Laboratory" where there is a possibility, with future medical school development, that they may be converted from an office to a laboratory, or the reverse. If these areas are initially intended as Offices, they are classified as such. Secretarial offices are frequently used for storage of files, records, etc; these are all classified as Offices (only).

Laboratories: These include all rooms and areas within the medical school which are intended for medical and scientific research; this includes, basic research, routine research, or other laboratory work of a service nature. Again, Laboratories are generally as listed in "Notes on Procedure for Non-Recurrent Grants".

The term "Laboratories",[1] which is listed in the headings of the tables discussed in this chapter, does not include laboratories that are intended for the purpose of teaching students, nor does it include Supplementary or Ancillary Laboratory accommodation as described in the following paragraphs.

Supplementary Laboratory Accommodation: The most common areas in this category are: preparation, wash-up, sample receiving, laboratory annex, or any other supplementary laboratory area which is necessary for the efficient operation of a research or a routine laboratory.

Ancillary Laboratories: In all laboratory institutions there are a number of subsidiary areas, which, although not necessarily equipped as laboratories (although such provision may be made for present or future use), are nonetheless essential in conjunction with research or routine laboratory work. The following have been classified in this category: balance rooms, centrifuge, dark rooms, instrument & balance rooms, microscope & projection rooms, temperature controlled rooms (refrigeration, incubation, hot rooms, etc.), chromatography, medium making, flame spectrophotometry, and electronmicroscope.

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1. Except as listed for tabluated headings, the term "Laboratory" will imply "General Laboratory" and will be meant to include all laboratory accommodation, that is, the total of Laboratory, Supplementary Laboratory, and Ancillary Laboratory accommodation. In later discussions, "Laboratory" as classified for table headings will be qualified by the term "Actual".

Workshops: Are provided for the maintenance of existing, and the development of new equipment. There is a wide variety of types; the following is a typical sample: engineering, wood, electronic, mechanical, instrument, metal, maintenance, general.

Stores: There are also several types. The following are typical: apparatus, equipment, chemical, solvents, records, stationery, sterile glassware, linen, isotope, workshop, microscope, alcohol, general.

Miscellaneous: Normally, rooms in this category are not associated directly with laboratory work. Their function is to assist in the efficient running of the medical school. The most common Miscellaneous provisions are: amenities and common rooms (by far the largest constituent), porterage and maintenance areas.

Teaching: All areas connected with medical teaching have been classified under this heading. A further breakdown of teaching areas will be made in the latter part of this chapter. (see footnote next page).

In addition to Category breakdowns, all departments have been broken down under their basic functions of teaching (T), research (R), and service (S),(as per the tabular designations at the left of all of the departmental areas in the Appendix tables 7 to 12). Only the teaching and research functions of the medical schools' Clinical departments have been tabulated. Small amounts of Clinical "service" may in fact occur in the medical schools, but as shown in

Chapter 2, the greater part of Clinical service is concerned directly with the wards and would be scheduled in with the teaching hospital. Where actual hospital or ward service has been scheduled in with the medical school Clinical departments, it has been omitted from the Appendix tables.

The Paraclinical and Preclinical departments do provide a "service" function in addition to the "teaching" and "research" functions. The schedules of accommodation of two medical schools have used an actual "T", "R", and "S" coding against individual rooms, and the process of area tabulation has been much simplified. In a number of instances rooms have been designated "R/S" where a function is divided between research and service; areas in this case have been halved in the Appendix area tables. If "T/R" of "T/S" codings have been used against rooms, the areas have been tabulated,respectively, as research or service, except, where the coded areas have come under any of the teaching classifications listed below. The following are the general areas included under "T", "R", and "S" classifications:

Teaching (T)	Research (R)	Service (S)
Seminars	Academic offices	Offices for for staff in connection with routine lab. work.
Tutorials	Academic labs.	Routine labs.
Teaching labs.	Research labs.	Suppl. & Anc. routine lab. accom.
Teaching lab. suppl. accom.	Suppl. & Anc. research lab. accom.	Workshops, Stores & other miscl. accom. in connection with routine. lab. work.
Lecture theatres & suppl. accom.	Workshops, Stores, & other miscl. accom. in connection with basic research.	
Museums		
Libraries		
Any other general teaching accom.		

Areas which have been tabulated from the abovementioned medical schools' schedules of accommodation are listed in Appendices 7 to 12 for whole school areas, and in Appendices 19 to 24 for teaching areas (only). Appendix 25 shows a histogram based on medical schools' area structures. Appendix 26 shows a histogram of medical schools' Paraclinical (B.S.) "T", "R", and "S" functions.

PRELIMINARY DISCOURSE ON MEDICAL SCHOOLS EXAMINED

All of the medical schools to be examined differ in a number of respects, for example, their curricula programmes, staff numbers (grades and sizes), student numbers, size and variety of departmental accommodation, two schools are "Full Curriculum" medical schools, the remainder are "Clinical" (only) medical schools. It is not felt that these discrepancies will affect the nature of the intended investigation. The differences between "Full Curriculum" and "Clinical" schools are as far as possible taken into account.

Royal Infirmary, Edinburgh (University of Edinburgh): Preclinical students receive their instruction in the University medical sciences buildings which are in the near vicinity of the Infirmary.(1)
4th, 5th, and 6th year students take the "Clinical" course in the teaching hospital proper. Other students at the Infirmary include postgraduates, dentals, science, and others undertaking special instruction who come from outside the hospital. A new curriculum was outlined in the report of a Clinical Curriculum Committee, June 1962, "based on a move towards a 'block' system of time allocation which has the advantage over the present 'layer' system of allowing greater flexibility, smaller cliniques, and a more effective use of all clinical resources " (see Fig.10).

The school's schedules of accommodation are presented under specific Clinical, Paraclinical, and Central divisional headings. Edinburgh is the largest medical school to be examined, providing more

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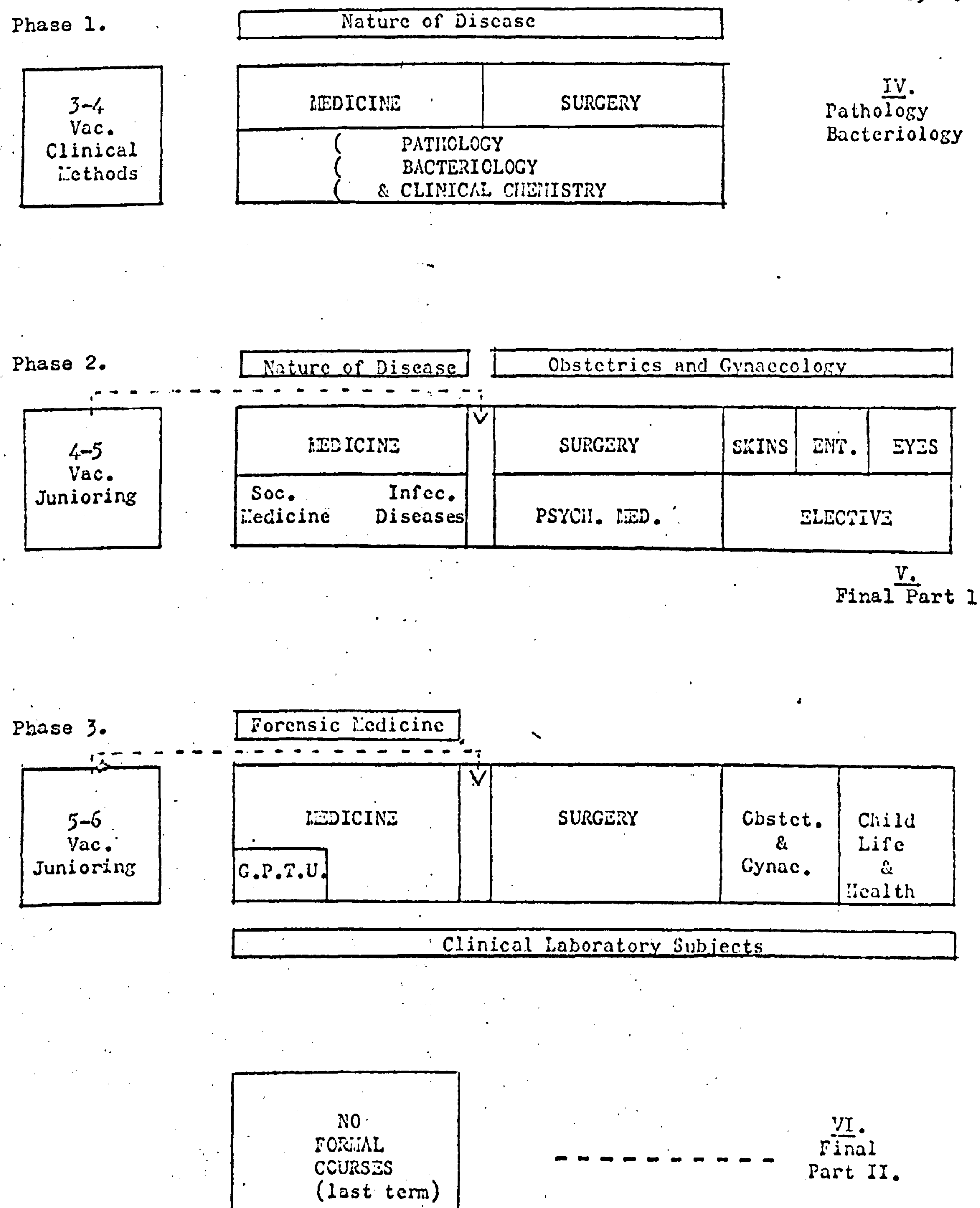
1. In the proposed teaching hospital it is intended to connect the "Clinical" and the Preclinical divisions of the medical school by a tunnel.

FIGURE 10. UNIVERSITY OF EDINBURGH: Outline curriculum contained in the Report of the Clinical Curriculum Committee, June 1962.



departments than any other school; these departments are also generally larger than those of the other schools. At the time that Edinburgh's schedules were released, one or two smaller departments were not to hand, and consequently the overall net area of the school shown in Appendix 7 will be a little less than its actual net area.(1) The Department of Surgery is scheduled under separate headings, "Clinical Surgery" and "Non-clinical Surgery". The latter is, in effect, a research department which makes considerable use of animal facilities. The sub-headings make a useful distinction. Edinburgh also includes a large department of Medical Physics, one of the newer specialties which makes wide use of radio-isotopes.

Architects: Robert Matthew, Johnson-Marshall & Partners.

Welsh National School of Medicine, Cardiff: It is intended that the Preclinical departments (Anatomy, Physiology, and Biochemistry) will be established as a part of the University College at Cathays Park, Cardiff. The Clinical school, which came into being in 1931, is one of the few independent clinical teaching institutions in this country. The proposed teaching hospital is to form part of a Medical Teaching Centre comprising teaching hospital, medical school, dental hospital, and dental school. Only the medical school will be considered in the following analysis.

The areas for the Welsh National School of Medicine are taken from the "Conditions and Instructions to Architects, and Schedules of Accommodation" in an architectural competition, 8th April, 1959.

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1. Revised schedules for the Royal Infirmary have since been released (May 1964).

The departments of the medical school cover all of the principal subjects of the "Clinical" curriculum. The successful architects in the competition were W. S. Milburn & Partners, M. Harding and J. Surtees.

University of Sheffield, Clinical Medical School: The University of Sheffield was not chartered until 1905, although the medical school preceded this date by almost a century.

It has been decided that the Preclinical departments will remain in the University buildings at Western Bank. The proposed teaching hospital and medical school in Glossop Road will accommodate all of the departments of the "Clinical" curriculum except Obstetrics & Gynaecology, and Paediatrics, which are contained in separate institutions. The first phase of the teaching hospital (the o.p.d.) has been operating since January 1961. The medical school will also provide part-time teaching for dental students.

Sheffield has adopted a number of individual approaches to medical teaching: (1) A tutorial system made up of small discussion groups of about 6 students under an academic staff member. The groups contain a student from each of the years of the medical course. They meet informally about twice a term and discuss a wide variety of topics; it seems to be popular with the staff and students. (2) A system is being developed whereby subjects in each year are integrated much more than was the custom under the traditional curriculum. (3) The examination system is being modified; it will rely less on factual memorization and place a greater store on an annual assessment of the medical student's overall progress. (4) A period of 3 months is set aside at the end of 4th year as an "elective period".

Architects: Adams, Holden and Pearson.

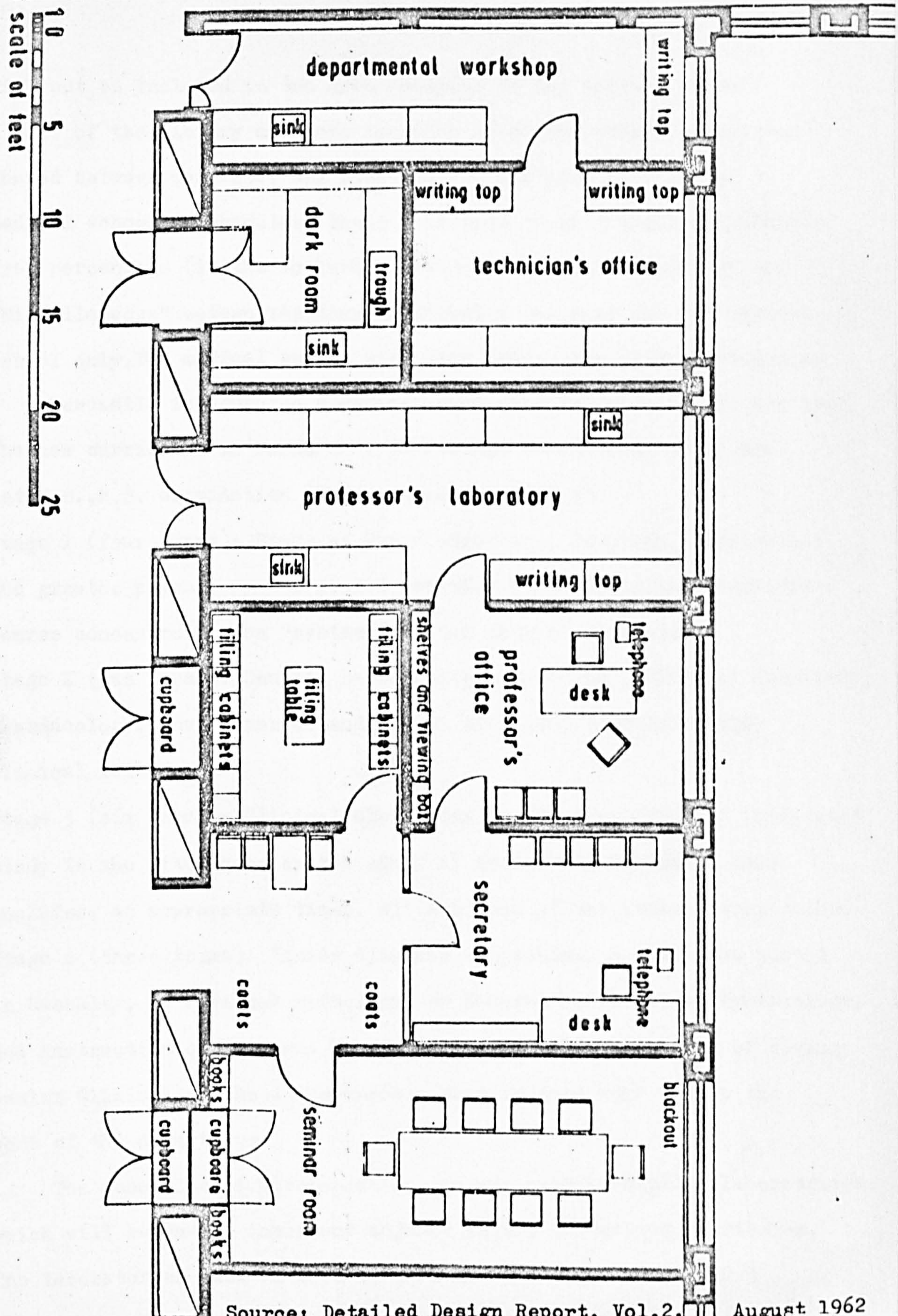
University of St.Andrews Medical School, Ninewells, Dundee: Preclinical instruction is carried out in St.Salvator' College, St.Andrews and Queen's College, Dundee. Although the Faculty of Medicine of St.Andrews University is situated at Queen's College, it is intended, after the completion of the proposed teaching hospital and medical school at Ninewells, that all "Clinical" instruction will in future be undertaken in the new institution. The medical school will contain all of the departments of the "Clinical" curriculum; it will also house some science and dental students.

St.Andrews schedules of accommodation are presented under specific Clinical, Paraclinical, and Central divisional headings. The areas scheduled for the school are more standardized than are those of the other British schools, for example, all Clinical departments approximate 6000 sq.ft., laboratory areas are sized in accordance with a unit area of 286 sq.ft., either in individual units or in areas made up of its multiples.

Architects: Robert Matthew, Johnson-Marshall & Partners.

University Medical School of Newcastle upon Tyne: It is a "Full Curriculum" school housing all of the departments of the full medical curriculum. The Department of Pathology is the only exception, as it is already established in the teaching hospital. There are additional departments, such as a Department of Industrial Health, and a small Department of Medical Physics. A dental hospital and dental school are also to be built on the same site, but dental school accommodation

FIGURE 11. UNIVERSITY OF ST.ANDREWS: Standard professorial suite



Source: Detailed Design Report, Vol.2, August 1962 will not be included in the area analysis of the medical school. A part of the library and some teaching areas and student amenities shared between dentistry and medicine are included in with the medical school's schedules. These will tend to give a slightly higher area percentage (in the following tables) under the "Teaching" and "Miscellaneous" categories than is actually the case for the medical school only.The medical school will also house some science students.

Newcastle inaugurated a revised medical curriculum in October 1962. The new curriculum is based on a four stage development after the 1st M.B.,B.S. examination (this remains unaltered).

Stage 1 (four terms): Study of human structure, function, development and growth, psychology and social relationships. It is an integrated course concentrating on "systems" rather than on "regions".

Stage 2 (two terms): General Bacteriology, Pathology, Clinical Chemistry, Pharmacology, Environmental and Social Medicine, Biometrics and Clinical Methods.

Stage 3 (six terms): Clinical clerkships in the mornings, and integrated study in the afternoons on the study of systems of the body; this includes, at appropriate times, all subjects of the medical curriculum.

Stage 4 (three terms): Senior Clinical clerkships, an elective period in Casualty, or Clinical Pathology, or General Practice, or Gynaecology, and instruction on Forensic Medicine. The school is desirous of giving senior Clinical clerks a responsible part in ward work and in the work of the department.

The schedules of accommodation include multidiscipline laboratories which will become an important adjunct to the integrated curriculum. The laboratories will be used by students in Stages 1, 2, and 3

Architects: Robert Matthew, Johnson-Marshall & Partners.

U.S. Department of Health, Education, and Welfare: The publication "Medical School Facilities, planning considerations and architectural guide" (1961) was produced as a result of combined efforts of the U.S. Public Health Service, the Ad Hoc Committee on Medical School Architecture of the Executive Council of the Association of American Medical Colleges, and the Council on Medical Education and Hospitals of the American Medical Association. The U.S. Department states in its foreword:

> "The lack of published reports on the planning and construction of medical education facilities and the great cost of constructing them has pointed up the need for guide material on planning and design requirements. There is great need for research in the design of teaching facilities for this highly organised and very expensive type of education."

To this end, "Medical School Facilities" presents much useful criteria on American medical education and medical school design, including, a number of suggested areas scheduled for two hypothetical medical schools - one with an intake of 64 medical students and the other with an intake of 96 students. The area schedules of the hypothetical schools are presented in a similar form to the schedules of accommodation of the previously mentioned British medical schools, and it was felt that a breakdown on similar lines to that of the British schools would be useful as a means of comparing medical schools in the two countries. The American schedules are, in fact, laid down in a more standardized form than any of the British schools, and the method of presentation simplified the adopted method of area tabulation.

In the following analysis, only the hypothetical school with an intake of 96 students will be examined. In a preliminary area study of the medical school with a 64 student intake, it was found that the general area percentages of the school were much the same as for the larger hypothetical school. The publication also schedules teaching hospital accommodation, but this will not be considered in the following analysis.[1]

For convenience in further discussions, the hypothetical medical school of the U.S. Department of Health, Education, and Welfare will be referred to as the "U.S. Dept. of H.E.W." This school (96 intake), schedules two types of accommodation: (1) a medical school with conventional or traditional teaching laboratories, and (2) a school with centralized multidiscipline teaching laboratories. These will be referred to, respectively, as "School Type 1" and "School Type (2). It should be mentioned that the hypothetical medical schools of the U.S. Dept. of H.E.W. are designed to accommodate students doing the usual American four year medical course, that is, 2 years Basic Sciences (something of a combination of the British Preclinical and Paraclinical divisions, with the emphasis on the laboratory aspect of medicine), and 2 years Clinical Sciences (it is similar to the British Clinical course in which students undertake clerkships on the ward, and serve in the o.p.d. and in casualty). Unless indicated otherwise, future discussion on the American school will refer to the School Type 1.

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1. Dr. George T. Harrell, chairman of the Committee responsible for the publication "Medical School Facilities", informs the author in recent correspondence (26th March, 1964) that a more comprehensive volume is now being prepared, entitled "Medical Education Facilities". The publication will give additional material on the teaching hospital; it is expected to appear around June 1964.

AREA TABULATION BY PERCENTAGE

For purposes of comparative evaluation, all medical schools' departmental and category areas, tabulated in Appendices 7 to 12, have been reduced to percentages. These percentages are tabulated in Appendices 13 to 18. The procedure will enable comparisons to be made between medical schools, and medical schools' individual departments, although these schools and their departments may differ in their actual size and content.

The tabulated Divisional Structure and Category Apportionment summary percentages (Tables 17 to 22), to be discussed in this chapter, are based on the Appendices' tables 7 to 12, and 13 to 18. They have been used to form the basis of a two-way study:

1. Divisional Structures by percentage: Each of the category areas (Offices, Laboratories, Workshops, etc.) of all of the medical schools' divisions (Clinical, Paraclinical, Preclinical, and Central) is expressed as a percentage of the whole division area. For example, in its Divisional Structure table, the area of Offices in the Clinical division of the Royal Infirmary, Edinburgh (Table 17) makes up 36.4% of the total area of the Clinical division.

2. Category Apportionment by percentage: Each of the divisional category areas is expressed as a percentage of the particular category area for the whole school. For example, in the Category Apportionment table for the University of St.Andrews (Table 20), the area of Clinical Offices is 40.7% of the school's total Clinical Office area.

It might be expected that the percentage tables will be reasonably accurate for large Divisional and Category areas, but, that these percentages will become increasingly less accurate with the diminishing size of the individual category area. In some instances only one or two rooms go to make up the category area and the Category percentage could be innacurate because of the small size of the category. In the Category Apportionment summary percentage tables, a greater accuracy can be expected for Offices, Laboratories, and Teaching, as these categories are generally larger than the other categories. In order to view each category area in a fuller perspective, the Divisional Structure and the Category Apportionment tables should be read in conjunction.

Discussions on percentage Tables 17 to 22 will be made under:

(1) "Divisional Structures": Each division will be discussed in the following order - Clinical, Paraclinical (B.S.), Central, and Whole School. Remarks will be made under sub-headings in the following order - Offices, Laboratories, Workshops, Stores, Miscellaneous, and Teaching.

(2) "Category Apportionment": Each category will be discussed in the following order - Offices, Laboratories, Workshops, Stores, Miscellaneous, Teaching, and Whole School. Remarks will be made under sub-headings in the following order - Clinical, Paraclinical (B.S.), and Central.

At the commencement of the discussion on each sub-heading, the following summary percentage figures will be given:

"Average": A summary percentage which will be meant to imply the median figure derived from the total of <u>all</u> percentages of <u>all</u> British medical schools, in each individual sub-heading category, divided by the number of schools making up the total percentage, that is, 5 schools in each instance.

"Range": The highest and the lowest percentages in each individual sub-heading category, together with the medical schools providing these percentages.

"U.S. Dept. of H.E.W.": The percentage of the hypothetical medical school of the U.S. Dept. of H.E.W. in each respective sub-heading category will also be provided to give a comparison with the percentages of the British medical schools.

In addition to the "Average" percentage described above, a "Mean" percentage will also be calculated in the sub-heading discussion on each category. This percentage will be derived from the totalled percentages, in each individual sub-heading category, of <u>only</u> those British medical schools from which a pattern appears to emerge, or which appear to make up a group, divided by the number of medical schools forming this kind of group. It is recognized that "mean" in the context of this definition is not strictly in accordance with the dictionary definition which refers to proportional average. For the purposes of this exercise, however, the term will be adequate.

In Chapter 2 (Part 2), reference was made to the Clinical, Paraclinical, and Preclinical divisions and departments of a British medical school. The U.S. Dept. of H.E.W. uses another term, "Basic Science", to describe one of its divisions. As mentioned in the early part of this chapter, Basic Science includes the subjects in years 1 and 2 of the usual American medical course, and the division is generally equivalent to the combined Paraclinical and Preclinical divisions of the British medical curriculum. In order to minimize confusion between the terms Paraclinical, Preclinical, and Basic Science, and in order to facilitate comparisons between "Full Curriculum" and "Clinical" schools, the term "Paraclinical (B.S.)" will be used. It can be taken to mean either: (1) Paraclinical only, for the "Clinical" medical schools (Edinburgh, Wales, Sheffield, and St.Andrews), or (2) the combination of Paraclinical and Preclinical for the "Full Curriculum" schools (Newcastle and the U.S. Dept. of H.E.W.). In the case of Newcastle, and unless intimated otherwise, Paraclinical(B.S.) will be the average of the percentages for the Paraclinical and the Preclinical divisions in the Divisional Structure table, and the total of the Paraclinical and the Preclinical divisions in the Category Apportionment table.

As Newcastle is the only "Full Curriculum" school of the 5 British medical schools examined, there is a liklihood that some of the school's percentages will not be in keeping with similar ones for the other "Clinical" schools. As far as is possible, attention will be drawn to any likely discrepancy, and it is also hoped that the percentage tables will be indicative of differences in area structures.

TABLE 17 ROYAL INFIRMARY, EDINBURGH

a. DIVISIONAL STRUCTURE

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	36.4	29.4	1.3	6.6	2.9	7.2	12.2	4.0	100
			37.3						
PARACLINICAL (Basic Science)	11.6	37.6	5.4	3.8	2.6	12.7	6.8	19.5	100
			46.8						
CENTRAL	1.5	28.9	-	-	4.0	3.0	25.7	36.9	100
WHOLE SCHOOL	16.1%	32.7%	2.6%	3.5%	3.1%	8.3%	13.9%	19.8%	100%
			38.8%						

b. CATEGORY APPORTIONMENT

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	67.4	26.9	14.5	55.3	27.8	26.1	26.3	6.0	29.8%
			28.7						
PARACLINICAL (Basic Science)	29.8	47.5	85.5	44.7	34.9	63.4	20.3	40.4	41.3%
			49.7						
CENTRAL	2.8	25.6	-	-	37.3	10.5	53.4	53.6	28.9%
			21.6						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 7 & 13

Figure below underlined "Labs."(actual),"Suppl." and "Anc." Laboratories is for General Laboratories.

TABLE 18 WELSH NATIONAL SCHOOL OF MEDICINE

a. DIVISIONAL STRUCTURE

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	32.8	33.0	2.4	4.0	4.4	9.1	-	14.3	100
			39.4						
PARACLINICAL (Basic Science)	25.5	28.4	5.3	3.0	2.4	8.6	7.8	19.0	100
			36.7						
CENTRAL	20.2	15.7	-	-	7.8	-	15.6	40.7	100
WHOLE SCHOOL	25.8%	26.3%	3.4%	2.5%	4.1%	6.7%	8.0%	23.2%	100%
			32.2%						

b. CATEGORY APPORTIONMENT

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	27.2	26.8	14.8	33.9	22.9	29.3	-	13.2	21.4%
			26.1						
PARACLINICAL (Basic Science)	54.2	59.2	85.2	66.1	31.9	70.7	53.8	45.0	54.9%
			62.4						
CENTRAL	18.6	14.1	-	-	45.2	-	46.2	41.8	23.7%
			11.5						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 8 & 14

See Footnote Table 17

TABLE 19 UNIVERSITY OF SHEFFIELD MEDICAL SCHOOL

a. DIVISIONAL STRUCTURE

	Offices	Labs.	Suppl. lab accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	28.1	47.3	1.9	4.4	2.2	1.8	10.9	3.4	100
			53.6						
PARACLINICAL (Basic Science)	17.8	34.8	9.2	3.8	0.8	6.3	5.4	21.9	100
			47.8						
CENTRAL	8.2	28.1	-	-	10.2	1.0	12.3	40.2	100
WHOLE SCHOOL	16.7%	35.1%	4.7%	2.7%	4.2%	3.7%	8.7%	24.2%	100%
			42.5%						

b. CATEGORY APPORTIONMENT

	Offices	Labs.	Suppl. lab accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	33.4	26.9	7.8	32.5	10.5	9.5	24.7	2.8	19.9%
			25.1						
PARACLINICAL (Basic Science)	50.4	46.9	92.2	67.5	9.1	81.4	29.1	42.9	47.3%
			53.3						
CENTRAL	16.2	26.2	-	-	80.4	9.1	46.2	54.3	32.8%
			21.6						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 9 & 15

See Footnote, Table 17

TABLE 20 UNIVERSITY OF ST.ANDREWS MEDICAL SCHOOL, NINEWELLS, DUNDEE

a. DIVISIONAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	18.8	49.5	3.5	7.9	4.1	9.7	1.3	5.2	100
			60.9						
PARACLINICAL (Basic Science)	11.1	47.7	2.4	5.8	0.9	6.6	2.3	23.2	100
			55.9						
CENTRAL	3.1	27.6	-	-	-	-	25.5	43.8	100
WHOLE SCHOOL	9.3%	39.6%	1.6%	3.8%	1.2%	4.5%	11.8%	28.2%	100%
			45.0%						

b. CATEGORY APPORTIONMENT									
CLINICAL	40.7	25.2	42.9	41.9	29.6	43.8	2.3	3.7	20.2%
			27.2						
PARACLINICAL (Basic Science)	45.2	45.6	57.1	58.1	70.4	56.2	7.4	31.2	37.9%
			47.2						
CENTRAL	14.1	29.2	-	-	-	-	90.3	65.1	41.9%
			25.6						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 10 & 16

See Footnote, Table 17

TABLE 21 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. DIVISIONAL STRUCTURE									
CLINICAL	28.1	38.4	1.0	4.8	3.3	6.9	8.3	9.2	100
			44.2						
PARACLINICAL	15.2	34.5	4.1	7.6	3.5	6.7	8.3	20.1	100
			46.2						
"PRECLINICAL"	11.8	18.6	3.5	6.1	2.1	3.8	4.0	50.1	100
			28.2						
BASIC SCIENCE+	13.5	26.6	3.8	6.9	2.8	5.3	6.2	35.1	100 (approx.)
			37.3						
CENTRAL	5.3	20.2	-	-	-	-	20.0	54.5	100
WHOLE SCHOOL	12.7%	26.1%	1.8%	3.7%	1.8%	3.4%	12.2%	38.3%	100%
			31.6%						
b. CATEGORY APPORTIONMENT									
CLINICAL	37.4	24.9	9.9	21.6	31.3	34.3	11.5	4.1	16.9%
			23.6						
PARACLINICAL	26.4	29.2	50.0	44.9	44.4	43.1	15.2	11.5	22.1%
"PRECLINICAL"	19.3	14.7	40.1	33.5	24.3	22.6	6.8	27.0	20.7%
BASIC SCIENCE++	45.7	43.9	90.1	78.4	68.7	65.7	22.0	38.5	42.8%
			50.6						
CENTRAL	16.9	31.2	-	-	-	-	66.5	57.4	40.3%
			25.8						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 11 & 17

See Footnote, Table 17

\+ Average of Paraclinical & "Preclinical".
++Total of " & " .

TABLE 22 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
hypothetical school type 1.

a. DIVISIONAL STRUCTURE

	Offices	Labs.	Suppl lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	27.9	47.8	3.2	3.2	-	3.7	2.3	11.9	100
			54.2						
BASIC SCIENCE	8.5	27.0	5.5	3.9	0.6	6.4	0.5	47.6	100
			36.4						
CENTRAL	6.2	19.4	-	-	2.5	-	26.0	45.9	100
WHOLE SCHOOL	12.2%	29.1%	3.0%	2.3%	1.2%	3.4%	10.2%	38.6%	100%
			34.4%						

b. CATEGORY APPORTIONMENT

	Offices	Labs.	Suppl lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	53.3	38.3	25.0	31.7	-	25.3	5.2	7.2	23.3%
			36.7						
BASIC SCIENCE	28.1	37.4	75.0	68.3	21.8	74.7	2.3	49.6	40.3%
			42.7						
CENTRAL	18.6	24.3	-	-	78.2	-	92.5	43.2	36.4%
			20.6						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 12 & 18

See Footnote, Table 17

TABLE 22 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
hypothetical school type 2 (with multidiscipline teaching labs.)

c. DIVISIONAL STRUCTURE

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	27.9	47.8	3.2	3.2	-	3.7	2.3	11.9	100
			54.2						
BASIC SCIENCE	11.6	36.0	7.6	5.4	0.8	8.7	0.7	28.3	100
			49.9						
CENTRAL	5.2	16.2	-	-	2.1	-	21.7	54.8	100
WHOLE SCHOOL	12.7%	30.2%	3.1%	2.4%	1.2%	3.6%	10.6%	36.2%	100%
			35.7%						

d. CATEGORY APPORTIONMENT

	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
CLINICAL	53.3	38.3	25.0	31.7	-	25.3	5.2	7.9	24.2%
			36.7						
BASIC SCIENCE	28.1	37.4	75.0	68.3	21.8	74.7	2.3	23.9	30.6%
			42.7						
CENTRAL	18.6	24.3	-	-	78.2	-	92.5	68.2	45.2%
			20.6						
	100	100	100	100	100	100	100	100	100.0%

Source: Appendices 12 & 18.

See Footnote, Table 17

(1) DIVISIONAL STRUCTURES

CLINICAL DIVISION:

Clinical Offices:

Average 28.8%: Range 18.8% (St.Andrews) - 36.4% (Edinburgh):

U.S. Dept. of H.E.W. 27.9%.

St.Andrews gives a comparatively low figure of 18.8%. The reduced Clinical Office percentage for St.Andrews is due in part to a very large area of Clinical Laboratories. The other four schools are in closer proximity to each other, and, if St.Andrews' percentage is disregarded, they give a Clinical Office mean of 31.4%. The average and the mean percentages for the British schools correspond fairly closely with that of the U.S. Dept. of H.E.W., and emphasize the importance placed on the provision of Offices in Clinical departments, in both countries.

The Clinical Office Average (28.9%) and the General Laboratory Average (47.1% - see below) may be used to arrive at a Clinical Office/ General Laboratory ratio. Based on these two Averages, Clinical Offices are approximately 61% of the size of Clinical General Laboratories. Using a similar procedure for the U.S. Dept. of H.E.W., Clinical Offices are 51% of the size of the hypothetical school's Clinical General Laboratories; as applied to St.Andrews, the Clinical Office/ General Laboratory ratio is 31% - it is considerably less than any of the other medical schools.

Clinical Laboratories:

General Labs:[1] Average 47.1%: Range 37.3% (Edinburgh) - 60.9% (St.Andrews): U.S. Dept. of H.E.W. 54.2%.

Actual Labs:[2] Average 39.5%: Range 29.4% (Edinburgh) - 49.5% (St.Andrews): U.S. Dept. of H.E.W. 47.8%.

Supplementary Lab. Accom: Average 2.0%: U.S. Dept. of H.E.W. 3.2%.

Ancillary Labs: Average 5.5%: U.S. Dept. of H.E.W. 3.2%

The percentages for General and Actual Laboratories are widely distributed. In contrast with its low Clinical Office percentage, St.Andrews gives a high General Laboratory figure: the other schools are a little closer around a General Laboratory mean of 43.6%. The Actual Laboratory mean is the same as the average, although the figure can only be regarded as very approximate.

Supplementary and Ancillary Laboratory percentages are fairly constant for all schools. Where a discrepancy does occur, it is generally larger or smaller in proportion to the size of the Actual Laboratory accommodation. Based on the above Average percentages for Actual, Supplementary, and Ancillary Laboratories, the following is a Clinical Laboratory structure for the British schools examined:

Actual Labs.	(Av. 39.5%)	84.0%)	
Supplementary Lab. Accom.	(Av. 2.0%)	4.3%)	100%
Ancillary Labs.	(Av. 5.5%)	11.7%)	

1.& 2. Reference should be made to the earlier definitions of the terms General and Actual Laboratories.

Clinical Workshops:

Average 3.4%: Range 2.2% (Sheffield) - 4.4% (Wales).

Workshops are consistently provided in all of the British medical schools; the American school makes no provision. The mean is the same as the average.

Clinical Stores:

Average 6.9%: Range 1.8% (Sheffield) - 9.7% (St.Andrews):
U.S. Dept. of H.E.W. 3.7%.

Sheffield is very low, and, if it is disregarded, the other schools provide a mean of 8.2%. It might be expected that Stores would be proportionally the same,in relation to General Laboratories,for all medical schools: the percentages of the schools examined do not bear this out, and it reflects a general lack of agreement on what amount of storage should be provided in the Clinical divisions. Based on the averages for Clinical Stores (6.9%) and for Clinical General Laboratories (47.1%), Clinical Stores are approximately 15% of the size of Clinical General Laboratories; for the British schools examined. The ratio of Clinical Stores/ General Laboratories for the U.S. Dept. of H.E.W. is 7%; by comparison with the British schools, this figure appears to be disproportional to the amount of General Laboratories provided.

Clinical "Miscellaneous":

Average 6.6%: Range 0% (Wales) - 12.2% (Edinburgh):
U.S. Dept. of H.E.W. 2.3%.

The wide variation in schools' percentages could be due to the different types of accommodation that go to make up "Miscellaneous".

The mean is the same as the average, although the figure is only very approximate.

As mentioned previously, much of the "Miscellaneous" category is comprised of staff amenities,and the variation could indicate some uncertainty by schools as to whether staff amenities should be provided in the department, or be centralized. Edinburgh has a comparatively high "Miscellaneous" percentage (12.2%) and it would seem to suggest that a large school with correspondingly large departments would tend to provide separate accommodation for these departments; a small to medium school would tend to centralize for economy and because distances within the school would probably be less.

Clinical Teaching:

Average 7.2%: Range 3.4% (Sheffield) - 14.3% (Wales):
U.S. Dept. of H.E.W. 11.9%

Wales is high, and, if it is disregarded, the other schools provide a more representative mean of 5.5%. The U.S. Dept. of H.E.W. is higher than the British average and mean, although it is fairly close to the Clinical Teaching percentage for Newcastle (9.2%).

PARACLINICAL (and/or Basic Science) DIVISION:

Paraclinical(B.S.) Offices:

Average 15.9%: Range 11.1% (St.Andrews) - 25.5% (Wales):
U.S. Dept. of H.E.W.8.5%.

Under Divisional Structures, the British average for Paraclinical(B.S.) Offices is approximately half of that for Clinical Offices, but, if they are viewed in the Category Apportionment tables, Offices in the Paraclinical(B.S.) division will be seen to make up a sizable percentage of the medical schools' total Office areas. The "reduced" Paraclinical(B.S.) Office percentage in the Divisional Structure tables is due to a substantial "increase" in Laboratory and Teaching areas over those of the Clinical division. For Wales, the Paraclinical(B.S.) Laboratory and Teaching percentages are comparatively low in its Divisional Structure table, with the result that the school's percentage for Paraclinical(B.S.) Offices is well above the average. If Wales is disregarded, and if Newcastle's Paraclinical (discounting Preclinical) Office percentage is used, the British schools provide a fairly consistent Paraclinical(B.S.) Office mean of 13.9%. This percentage would apply to "Clinical" schools only.

Based on the averages for Paraclinical(B.S.) Offices(15.9%) and for Paraclinical(B.S.) General Laboratories (44.9% - see below), Paraclinical (B.S.) Offices are approximately 35% of the size of Paraclinical(B.S.) General Laboratories. This ratio is much smaller than that for the Clinical division, and it reflects the big "increase" of Paraclinical(B.S) General Laboratories over those of Clinical. For the U.S. Dept. of H.E.W., the Paraclinical(B.S.) Office/ General Laboratory ratio is 23%, a figure which is fairly close to St.Andrews' ratio of 20%. St.Andrews' ratio is again well below that of the other British schools.

The Divisional Structure Office percentage for the U.S. Dept. of H.E.W. School Type 1 (traditional laboratories) is lower than all of the British schools' Office percentages; this percentage also contrasts very noticeably with the high Office percentage in the hypothetical school's Clinical division.

Paraclinical(B.S.) Laboratories:

General Labs: Average 44.9%: Range 36.7% (Wales) - 55.9% (St.Andrews): U.S. Dept. of H.E.W. 36.4%.
Actual Labs: Average 35.0%: Range 26.6% (Newcastle) - 47.7% (St.Andrews): U.S. Dept. of H.E.W. 27.0%.
Supplementary Lab. Accom: Average 5.2%: U.S. Dept. of H.E.W. 5.5%.
Ancillary Laboratories: Average 4.7%: U.S. Dept. of H.E.W. 3.9%.

It is difficult to perceive a positive grouping for the percentages in this category and it is necessary, therefore, to have regard to the other sub-heading categories for Laboratory percentages. In all divisions, St.Andrews provides high Laboratory percentages, and it is likely that the school's percentages for Paraclinical(B.S.) Laboratories will also be higher than the general trend shown by the other schools. It can also be seen that Newcastle provides a much smaller Paraclinical(B.S.) General Laboratory percentage than does the school for Paraclinical without the Preclinical division. Newcastle's Preclinical division has a small percentage provision of General Laboratories and a correspondingly high percentage for Teaching, and it is apparent that the "inclusion" of Preclinical in with the Paraclinical division has caused the"reducation"in the overall Paraclinical(B.S.) General Laboratory percentage. If St.Andrews is disregarded on the above assumption, and if Newcastle's Paraclinical (only) percentage is considered, 4 schools provide a mean for General Laboratories of 44.4%. This would apply to "Clinical" schools only.

Following a similar line of reasoning for Actual Laboratories, 4 schools - St.Andrews disregarded, Newcastle's Paraclinical (only) percentage used - provide an Actual Laboratory mean of 33.8% ("Clinical" schools only).

Based on the Paraclinical(B.S.) averages for Actual, Supplementary, and Ancillary Laboratories, the following is the Paraclinical(B.S.) Laboratory structure for the British schools examined:

Actual Labs.	(Av. 35.0%)	78.0%)	
Supplementary Lab. Accom.	(Av. 5.2%)	11.6%)	100%
Ancillary Labs.	(Av. 4.7%)	10.4%)	

It is noticeable that Ancillary Laboratories are present in approximately the same proportions in both the Clinical and the Paraclinical(B.S.) divisions whereas Supplementary Laboratory Accommodation in the Paraclinical(B.S.) division is almost three times the percentage amount of that in the Clinical division. Much of the"extra" Supplementary Laboratory accommodation in Paraclinical(B.S.) could be attributed to the amount of preparation and reception areas required in connection with routine laboratory work undertaken in this division.

Paraclinical(B.S.) Workshops:

Average 1.9%: Range 0.8% (Sheffield) - 2.8% (Newcastle):
U.S. Dept. of H.E.W. 0.6%.

All schools provide Paraclinical(B.S.) Workshops. These make up a very small proportion of the division's total area, and, as shown in the Appendix area tables, they are usually concentrated in one or two departments (especially Medical Physics). If Newcastle's Paraclinical (only) Workshop percentage is used, the 5 British schools provide a mean of 2.0%. This would apply to "Clinical" schools only.

Paraclinical(B.S.) Stores:

Average 7.9%: Range 5.3% (Newcastle) - 12.7% (Edinburgh):
U.S. Dept. of H.E.W. 6.4%.

The percentage for Edinburgh is higher than for the other schools; if it is disregarded, the other British schools provide a mean of 7.1%. This would apply to "Clinical" schools only (Newcastle's Paraclinical - only - percentage is used).

Based on the averages for Paraclinical(B.S.) General Laboratories and Paraclinical(B.S.) Stores, the Paraclinical(B.S.) Stores/ General Laboratories ratio is 18%. This is a little higher than the Clinical ratio, although both Paraclinical(B.S.) and Clinical Stores/ General Laboratories ratios are fairly close to the U.G.C.'s suggested figure of 15% (see Appendix 6). The Paraclinical(B.S.) Stores/ General Laboratories ratio for the U.S. Dept. of H.E.W. is 14%.

Paraclinical(B.S.) "Miscellaneous:

Average 5.7%: Range 2.3% (St.Andrews) - 7.8% (Wales):
U.S. Dept. of H.E.W. 0.5%.

Four schools are in close proximity to the average, and they provide a mean of 7.2%. This would apply to "Clinical" schools only (Newcastle's Paraclinical - only - percentage is used); St.Andrews' percentage is considerably lower than the other schools and it is disregarded.

The greater consistency of "Miscellaneous" percentages in the Paraclinical(B.S.) division, by comparison with those in the Clinical division, is due no doubt to the fact that the Paraclinical(B.S.) departments are, on the whole, larger than the Clinical departments and, in accordance with the earlier remarks under "Clinical Miscellaneous", it is more likely that the larger departments would provide separate amenities for their staff.

St.Andrews' low "Miscellaneous" percentage points to a different approach in the planning of its school. Standardization has been noted previously in the school's planning and scheduling, and it is apparent that staff amenities for both the Clinical and Paraclinical (B.S.) divisions have also been scheduled under an adopted policy of centralization. The Paraclinical(B.S.) accommodation of some medical schools includes patient accommodation in the departments; St.Andrews does not provide this accommodation in its Paraclinical(B.S.) division. A similar approach to that of St.Andrews is also apparent in the hypothetical school of the U.S. Dept. of H.E.W.

Paraclinical(B.S.) Teaching:

Average 23.7%: Range 19.0% (Wales) - 35.1% (Newcastle): St.Andrews 23.2% is the highest "Clinical" school:
U.S. Dept. of H.E.W. School 1 47.6%, School 2 28.3%.

The four "Clinical" schools closely approximate the average. Newcastle, the only "Full Curriculum" school does not, and again it gives a closer resemblance to the U.S. Dept. of H.E.W. Newcastle's Paraclinical (only) Teaching percentage of 20.1% is, however, very close to those of the other four schools, and it combines to provide a very consistent mean of 20.7% (for "Clinical" schools only).

The U.S. Dept. of H.E.W. is well above the British average. The very high percentage is due to the integration of the "Preclinical" subjects (Anatomy, Physiology, etc.) with the other "Paraclinical" sciences. The medical school Type 2 (with central multidiscipline laboratories) gives a much reduced percentage, but this is still well above the British average.

CENTRAL DIVISION:

Central Offices:

Average 7.8%: Range 1.5% (Edinburgh) - 20.2% (Wales):
U.S. Dept. of H.E.W. 6.2%.

Three "Clinical" schools give a mean of 4.3%; Wales is exceptionally high and it is discounted. In all schools,"Central Offices"refers to medical school administration offices (only), and the Divisional Structure (and Category Apportionment) tables give a good indication of the relative size of this facility in each of the medical schools examined. Newcastle's Office percentage is very close to the "Clinical" schools' mean.

Central Laboratories:

General Labs: Average 24.1%: Range 15.7% (Wales) - 28.9% (Edinburgh):
U.S. Dept. of H.E.W. 19.4%.

In keeping with a high Central Office percentage, Wales shows a much lower percentage for Central Laboratories by comparison with the other schools. This low General Laboratory percentage for the school is indicative of animal quarters which are considerably smaller than are those of the other medical schools. The other "Clinical" schools provide a mean of 28.2% (Newcastle is not considered).

It will be noted that, under "Central Laboratories", no attempt is made to categorise the individual Actual, Supplementary, and Ancillary Laboratories. In all schools, "Central Laboratories" applies mainly to animal quarters; no attempt has been made to "categorise" these facilities.

The two "Full Curriculum" schools Newcastle and the U.S. Dept. of H.E.W. are both very close around a Central Laboratory figure of 20%.

Central Workshops:

Average 4.4%: Range 0% (Newcastle, St.Andrews) - 10.2% (Sheffield):
U.S. Dept. of H.E.W. 0%.

Central Workshop provision is so variable that the average cannot be taken as a representative figure. Two schools provide no Central Workshop accommodation and it is clear that there is no general agreement as to whether, or not, workshops should be provided centrally, or, if they are provided, what the relative size of this accommodation should be. 4 "Clinical" schools provide a mean of 5.5% although this can only be taken as being very approximate.

Central Stores:

Only Sheffield and Edinburgh schedule Central Storage: 1.0% and 3.0% respectively. The mean is the same as the average although, as for Workshops, it is only very approximate. All schools' percentages indicate a preference for storage in the department.

Central "Miscellaneous":

Average 19.8%: Range 12.3% (Sheffield) - 25.7% (Edinburgh):
U.S. Dept. of H.E.W. 26.0%.

The accommodation in this category pertains mostly to amenities, maintenance, and photography. Percentages in the upper part of the range indicate a greater emphasis, by these schools, on the centralization and sharing of the abovementioned facilities.

The 4 "Clinical" schools provide a mean of 19.8% which is, by coincidence, exactly the same as the average.

Central Teaching:

Average 43.2%: Range 36.9% (Edinburgh) - 54.5% (Newcastle): St.And. 43.8%: U.S. Dept. of H.E.W. School 1 45.9%, School 2 54.4%.

Four schools (Newcastle the exception) are closely aligned and give precise mean of 40.4%. All of the schools' percentages, here, are in keeping with their character. The four "Clinical" schools all closely approximate the mean; Newcastle, the only British "Full Curriculum" school, has the highest percentage which is an indication of its centralized multidiscipline teaching laboratories. Newcastle's percentage is very close to that of the U.S. Dept. of H.E.W. School 2 (with multidiscipline laboratories), and it is evident that there is a teaching affinity between these schools.

WHOLE SCHOOL (Divisional Structures):

Whole School Offices:

Average 16.1%: Range 9.3% (St.Andrews) - 25.8% (Wales):
U.S. Dept. of H.E.W. 12.2%.

The mean for the "Clinical" schools is 14.0%; Wales is fairly high and it is discounted. Newcastle's Office percentage (12.7%) is almost identical with that of the U.S. Dept. of H.E.W. There seems to be a general agreement between the British schools on the overall ratio of Office provision; St.Andrews is, perhaps, the exception. The mean shows no appreciable difference from that of the American hypothetical school.

Based on the averages for Whole School Offices and Whole School General Laboratories (38.0% - see below), Whole School Offices are approximately 42% of the size of Whole School General Laboratories, for the British schools examined. For the U.S. Dept. of H.E.W., the Whole School Office/ General Laboratory ratio is approximately 35%. St.Andrews, with an Office/ General Laboratory ratio of 21%, is again much the lowest of the medical schools examined.

Whole School Laboratories:

General Labs: Average 38.0%: Range 31.6% (Newcastle) - 45.0% (St.Andrews):
U.S. Dept. of H.E.W. 34.4%.
Actual Labs: Average 32.0%: Range 26.1% (Newcastle) - 39.6% (St.Andrews):
U.S. Dept. of H.E.W. 29.1%.
Supplementary Lab. Accom: Average 2.8%: U.S. Dept. of H.E.W. 3.0%.
Ancillary Laboratories: Average 3.2%: U.S. Dept. of H.E.W. 2.3%.

A general pattern appears to emerge for the "Clinical" schools and these, with the exception of Wales, give General and Actual Laboratory means of 42.1% and 35.8% respectively. The "Full Curriculum" schools are also similar; the American School Type 2 provides 4.2% more Actual Laboratories but the same ratio amount of Supplementary and Ancillary Laboratories as Newcastle.

Wales, with high Office percentages (for the Whole School and in all divisions), provides relatively less laboratory area than any of the other British schools. Newcastle's General and Actual Laboratory percentages are slightly less than are those of Wales, but this is due to a substantial "increase" of teaching areas in the "Full Curriculum" school necessitated by the inclusion of the Preclinical years.

Supplementary Laboratory accommodation, although making up only a small percentage of the schools' totals, varies somewhat between the schools. It is noticeable that St.Andrews provides the highest Actual Laboratory percentage, but the lowest figure for Supplementary Laboratories. This is contrary to expectation and it could suggest, in this instance, a higher degree of standardization in keeping with other planning provisions in the school. The percentages for Ancillary Laboratories are very consistent in all schools.

Based on the Whole School averages for Actual, Supplementary, and Ancillary Laboratories, the following is the Whole School Laboratory structure for the British schools examined:

Actual Labs. (1)	(Av. 32.0%)	84.2%)	
Supplementary Lab. Accom.	(Av. 2.8%)	7.4%)	100%
Ancillary Labs.	(Av. 3.2%)	8.4%)	

1. The percentage for Actual Laboratories will be slightly high due to there being no "Actual, Supplementary, and Ancillary" Laboratory breakdown in the Central division.

Whole School Workshops:

Average 2.9%: Range 1.2% (St.Andrews) - 4.2% (Sheffield):
U.S. Dept. of H.E.W. 1.2%.

The 4 "Clinical" schools provide a fairly consistent mean of 3.2%.

Whole School Stores:

Average 5.3%: Range 3.4% (Newcastle) - 8.3% (Edinburgh):
U.S. Dept. of H.E.W. 3.4%.

The large amount of Storage in Edinburgh's Paraclinical(B.S.) division accounts for its large Whole School percentage. The other "Clinical" schools provide a mean of 5.0%. Based on the averages for Whole School Stores and General Laboratories (38.0%), the Whole School Stores/ General Laboratories ratio is 14% for the British schools examined. For the U.S. Dept. of H.E.W. the Stores/ General Laboratory ratio is 9%.

Whole School "Miscellaneous":

Average 10.9%: Range 8.0% (Wales) - 13.9% (Edinburgh):
U.S. Dept. of H.E.W. 10.2%.

The schools' percentages are evenly displaced around the average. Too great a store cannot be placed on this consistency because of the various inclusions of areas in the "Miscellaneous" category. Amenities are, however, the biggest item by far and the average gives some indication of the amount of provision for this facility. The 4 "Clinical" schools provide a mean of 10.6%. Newcastle is close to this figure.

Whole School Teaching:

Average 26.7%: Range 19.8% (Edinburgh) - 38.3% (Newcastle): St.And. 28.2%:
U.S. Dept. of H.E.W. School 1 38.6%, School 2 36.2%.

Earlier remarks made under "Central Teaching" also apply to this category. The 4 "Clinical" schools give a mean of 23.9%. The percentages for Newcastle and the U.S. Dept. of H.E.W. are again very close.

(2)CATEGORY APPORTIONMENT

OFFICES:

Offices - Clinical:

Average 41.2%: Range 27.2% (Wales) - 67.4% (Edinburgh):
U.S. Dept. of H.E.W. 53.3%

The percentages of all schools are scattered. Edinburgh is extremely high however, and, if it is disregarded, the other schools provide a mean of 34.7%. The most notable feature of the Office - Clinical Apportionment is that of a wide differential between the U.S. Dept. of H.E.W. and the British average (and mean). With the exception of Edinburgh, the highest percentage for the British schools is approximately 13% less than the hypothetical American school.

Offices - Paraclinical(B.S.):

Average 45.1%: Range 29.8% (Edinburgh) - 54.2% (Wales):
U.S. Dept. of H.E.W. 28.1%.

Edinburgh's high Clinical percentage is offset by a relatively low figure for Paraclinical(B.S.); if it is disregarded, the other schools provide a mean of 48.9%. The previous difference noted between the British and the American schools for Clinical Office Apportionment applies conversely in the case of the Paraclinical(B.S.) Office Apportionment. The difference,in the relative emphasese on Clinical and Paraclinical(B.S.) Office Apportionments, is one of the most outstanding observed, in this analysis, between the British schools and the hypothetical school of the U.S. Dept. of H.E.W.

Offices - Central:

Average 13.7%: Range 2.8% (Edinburgh) - 18.6% (Wales):
U.S. Dept. of H.E.W. 18.6%.

Four schools (Edinburgh the exception) provide a mean of 16.5%.

LABORATORIES (Category Apportionment):

Laboratories - Clinical:

General Labs: Average 26.1%: Range 23.6% (Newcastle) - 28.7% (Edinburgh):
U.S. Dept. of H.E.W. 36.7%
Actual Labs: Average 26.1%: Range 24.9% (Newcastle) - 26.9% (Sheffield):
U.S. Dept. of H.E.W. 38.3%.

The ranges for General and Actual Laboratories show all British schools to be closely distributed around the average which is one of the most precise for the Category Apportionment tables. The mean is, therefore, the same as the average(for Actual and General Laboratories). From previously, the Clinical Divisional Structures have been shown to vary in the British schools, but there seems to be a general agreement on the ratios of Clinical Laboratories/ Whole School Laboratory areas. Coincidentally, the General and Actual Clinical Laboratory Apportionments are exactly the same. The U.S. Dept. of H.E.W. differs considerably from the British figures.

Supplementary and Ancillary Laboratory areas are small and no attempt is made to generalize on the respective figures in the Category Apportionment tables. The importance of these laboratories to the functional efficiency of Actual Laboratories, in all divisions, should be emphasized however.

Laboratories - Paraclinical(B.S.):

General Labs: Average 52.6%: Range 47.2% (St.Andrews) - 62.4% (Wales): U.S. Dept. of H.E.W. 42.7%

Actual Labs: Average 48.6%: Range 43.9% (Newcastle) - 59.2% (Wales): U.S. Dept. of H.E.W. 37.4%.

For General and Actual Laboratories, 4 schools closely approximate the averages and provide means of 50.2% and 46.0% respectively (Wales is the exception in both cases).

The tabulated Paraclinical(B.S.) percentages for Supplementary and Ancillary Laboratories are approximately **twice** those for the Clinical division, giving an "increase" which is proportionally similar to that of Paraclinical(B.S.) Actual Laboratories over Clinical Actual Laboratories.

Laboratories - Central:

General Labs:[(1)] Average 21.2%: Range 11.5 (Wales) - 25.8% (Newcastle): U.S. Dept. of H.E.W. 20.6%.

Actual Labs:[(1)] Average 25.3%: Range 14.1% (Wales) - 31.2% (Newcastle): U.S. Dept. of H.E.W. 24.3%.

If the low Wales' percentages are excluded, the other schools provide means of 23.7% for General Laboratories and 28.1% for Actual Laboratories.

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1. The same Central Laboratory area is used in the calculations for General and Actual Laboratory Category Apportionments.

WORKSHOPS (Category Apportionment):

Clinical: Range 10.5% (Sheffield) - 31.3% (Newcastle): U.S. Dept. 0%.

Paraclinical(B.S.): Range 9.1%(Sheffield) - 70.4%(St.Andrews):U.S. Dept. 21.8%.

Central: Range 0%(Newcastle & St.Andrews) - 80.4%(Sheffield): U.S. Dept. 78.2%.

General Comment: Earlier remarks made under Divisional Structures (Central) as to the lack of consistency in the amounts of Workshop provision made by medical schools are born out by the Category Apportionment percentages. The areas are small, and there is no apparent consistency between any of the schools examined. Sheffield noticeably centralizes the largest proportion of its Workshops.

STORES:

Clinical: Range 9.5% (Sheffield) - 43.8% (St.Andrews): U.S. Dept. 25.3%.

Paraclinical(B.S.): Range 56.2% (St.Andrews) - 81.4% (Sheffield): U.S. Dept. 74.7%.

Central: Range 0% (Wales, Newcastle, St.Andrews) - 10.5% (Edinburgh): U.S. Dept. 0%.

General Comment: The areas are again too small to generalize. Only two British schools provide any Central Storage, and this is a very small Apportionment in both cases. All of the schools examined provide for the largest amount of Storage in the Paraclinical(B.S.) division, although,it should be noted that the percentages of the schools fluctuate widely in this division.

"MISCELLANEOUS" (Category Apportionment):

Clinical: Range 0% (Wales) - 26.3% (Edinburgh): U.S. Dept. 5.2%

Paraclinical(B.S.): Range 7.4% (St.Andrews) - 53.8% (Wales): U.S. Dept. 2.3%.

Central: Range 46.2% (Sheffield, Wales) - 90.3% (St.Andrews):U.S. Dept. 92.5%.

General Comment: The general tendency is for schools to provide for most of their "Miscellaneous" in the Central division; Wales is the exception. As suggested by its Divisional Structure, St.Andrews gives the very high ratio of 90.3% in the Category Apportionment table. The U.S. Dept. of H.E.W. also provides a very high "Miscellaneous"Central Category Apportionment.

TEACHING:

Teaching - Clinical:

Average 6.0%: Range 2.8% (Sheffield) - 13.2% (Wales):
U.S. Dept. of H.E.W. School 1 7.2%, School 2 7.9%.

Wales is noticeably higher than the other schools and, if its percentage is disregarded, the other 3 "Clinical" schools give a mean of 4.2%. The low Category Apportionment Teaching percentage corresponds with an equally low Teaching figure under Divisional Structures. Both tables indicate the small amount of Clinical medical school accommodation that is required for formal teaching on the Clinical subjects, the bulk of teaching being undertaken by ward apprenticeship, and,in teaching accommodation located in the immediate vicinity of the ward.

Newcastle's percentage is almost exactly the same as the "Clinical" schools' mean, but by comparison with the "Clinical" schools, Newcastle does in effect provide proportionally more Clinical teaching accommodation than its percentage indicates. A truer indication of the ratio of Newcastle's Clinical Teaching Apportionment might be given if the Preclinical teaching areas (including multidiscipline laboratories) are discounted from the total teaching area; the Clinical Teaching Apportionment would then become 8.5% (see also later discussion under "Student Ratios").

The Clinical Teaching Apportionment for the U.S. Dept. of H.E.W. exceeds the percentages of all of the British schools with the exception of Wales, and it confirms the hypothetical school's high Divisional Structure Clinical percentage. The Teaching percentages for the U.S. Dept. of H.E.W. indicate: (1) a more liberal provision of Clinical Teaching accommodation than is scheduled for the British schools, and (2) a greater emphasis on the formal aspect of Clinical teaching, that is, lectures, discussions, practical work, etc.

Teaching - Paraclinical(B.S.):

Average 39.6%: Range 31.2% (St.Andrews) - 45.0% (Wales):
U.S. Dept. of H.E.W. School 1 49.6%, School 2 23.9%.
Three "Clinical" schools approximate the average and they provide a mean of 42.8% (St.Andrews is disregarded).

Teaching - Central(B.S.):

Average 54.4%: Range 41.8% (Wales) - 65.1% (St.Andrews):
U.S. Dept. of H.E.W. School 1 43.2%, School 2 68.2%.
St.Andrews' Paraclinical(B.S.) Teaching percentage is low; the school's Central Teaching percentage is correspondingly high, and it is likely that a more representative grouping would be provided by the other "Clinical" schools. The mean is therefore 49.9% ("Clinical" schools only).

Contrary to expectation, the Central Teaching Apportionment for Newcastle (57.4%) differs considerably from that of the U.S. Dept. of H.E.W. School 2 (68.2%), although both schools provide multidiscipline laboratories.

WHOLE SCHOOL (Category Apportionment):

Whole School - Clinical:

Average 21.6%: Range 16.9% (Newcastle) - 29.8% (Edinburgh):
U.S. Dept. of H.E.W. School 1 23.3%, School 2 24.2%.

Newcastle's "Full Curriculum" structure accounts for its low percentage. It is interesting to observe that the school's Clinical Apportionment is 21.4% when "Preclinical" is deleted from the total area; the figure corresponds closely with three of the other "Clinical" schools. Previously, Edinburgh has been shown to have high Office percentages in both the Divisional Structure and the Category Apportionment tables. If Edinburgh is discounted, the other three "Clinical" schools provide a mean of 20.5%.

The percentage for the U.S. Dept. of H.E.W. is very close to the British mean, but, as this school includes "Preclinical" departments, the actual size of its Clinical division relative to the area of the Whole School is considerably above that of the British schools, including Newcastle. These "Whole School" percentages also support an earlier observation on the apparently greater Clinical emphasis in the American hypothetical school.

Whole School - Paraclinical(B.S.):

Average 44.8%: Range 37.9% (St.Andrews) - 54.9% (Wales):
U.S. Dept. of H.E.W. School 1 40.3, School 2 30.6%.

Wales is noticeably low under Central Whole School Apportionments (following), and it is high for its Paraclinical(B.S.) Whole School Apportionment. It is likely, therefore, that the other 3 "Clinical" schools will provide a more representative mean in both divisions; the Paraclinical(B.S.) mean is 42.2%. Newcastle's Paraclinical(B.S.) Apportionment percentage is very close to this figure.

Whole School - Central:

Average 33.5%: Range 23.7% (Wales) - 41.9 (St.Andrews):
U.S. Dept. of H.E.W. School 1 36.4%, School 2 45.2%.

The "Clinical" school mean is 34.5% (Wales is disregarded).

STAFF AND STUDENT DENSITY RATIOS

None of the staff and student ratios discussed in Chapter 2 takes any account of their relationships to medical school areas; such a procedure would be necessary if they were to be viewed in their fullest perspective. It would make an interesting study but it could not be undertaken because of the complicated procedures that would have been involved in obtaining information on the areas of the medical schools. In connection with the medical schools analysed in this chapter, an attempt of this nature is made to relate their staff and student numbers to the respective areas that they use.

STAFF:

Based on the staff numbers and the medical school areas listed in Appendix 27, a number of ratios are provided in Table 23 showing various areas available per staff member. Only full-time academic staff are considered in these ratios which are all caculated by dividing the respective areas used, by the total number of staff using these areas (Clinical, Paraclinical, Preclinical, or All).[1] The present and the future importance of research in medical schools was underlined in the previous chapter and special reference is made to the density ratios for research areas and research laboratories. The following ratio headings are used in Table 23 (a brief discussion will also be made on the figures under each of these headings):

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1. All Teaching areas (designated "T" in Appendices tables 7 to 12) are excluded in these calculations.

TABLE 23 Ratios of Paraclinical(B.S.)/ Clinical academic staff & various ratios of available net area/ academic staff member. Source: Appendix 27.

	(1) Ratio acad. staff Parac. (B.S.)/ Clin. staff	(2) All acad. staff nos./ whole school area	(3) All acad. staff nos./ all resrch. area	(4) Divis. acad. staff nos./ all divis. resrch. area	(5) Divis. acad. staff nos./ divis. resrch. lab. area	(6) All acad. staff nos./ all resrch. lab. area	(7) All acad. staff nos./ all lab area
Edinburgh	0.5 :1	1000 sq.ft./ staff member	620 sq.ft./ staff member	C.545 sq.ft/ P.460 sq.ft/ staff member	C.210 sq.ft/ P.311 sq.ft/ staff member	350 sq.ft./ staff member	485 sq.ft./ staff member
Wales	2.0 :1	1160 sq.ft.	740 sq.ft.	C.840 P.605 sq.ft.	C.385 P.205 sq.ft.	320 sq.ft.	485 sq.ft.
Sheffield	1.6 :1	1110 sq.ft.	720 sq.ft.	C.740 P.495 sq.ft.	C.410 P.295 sq.ft.	473 sq.ft.	620 sq.ft.
St.Andrews	1.2 :1	1260 sq.ft.	840 sq.ft.	C.745 P.550 sq.ft.	C.475 P.400 sq.ft.	640 sq.ft.	790 sq.ft.
Newcastle	1.3 :1	1130 sq.ft. (1250 exc. Pc.)	810 sq.ft. (875 exc. Pc.)	C.665 P.700 Pc620 sq.ft.	C.320 P.389 Pc384 sq.ft.	510 sq.ft. (550 exc. Pc.)	580 sq.ft. (630 exc. Pc.)
U.S. Dept. of H.E.W.	0.6 :1	1020 sq.ft.	765 sq.ft.	C. 545 BS.820 sq.ft.	C. 325 BS.580 sq.ft.	543 sq.ft.	575 sq.ft.

1. Except in (1), all figures are for available sq.ft./ academic staff member (postgraduates and others are not included).

2. The following abbreviations apply: C. (Clinical), P. (Paraclinical), Pc. (Preclinical), BS. (Basic Science).

3. In (2), (3), (6), and (7), staff density ratios for Newcastle are expressed firstly for the Whole School and secondly in terms of the school without the Preclinical division.

(1) Ratio of Academic Staff Numbers: Paraclinical(B.S.)/ Clinical:

Some difficulty was experienced in ascertaining staff numbers from the medical schools' schedules of accommodation. There were a number of reasons for this, for example, full-time and part-time staff are not necessarily stated, the medical schools vary in their classification of faculty and/or N.H.S. grades, some schools give staff in terms of the present and others in terms of the future - in one school this even applied to individual departments. These vagaries leave much room for innacuracy, and,for this reason,a check was carried out by reference to the numbers of academic staff listed in the Commonwealth Universities Year Book, 1963. It was suggested by one medical school - as a "general rule of thumb" at that particular medical school - that the staff numbers for the proposed medical school would be approximately 25% more than the present number of academic staff. A similar check was carried out on the other medical schools analysed in this chapter and the ratio figure of 25% was found to be somewhat conservative: it varied between 20% and 150%, but it was more commonly centred around 75%.

The ratio of Paraclinical(B.S.)/ Clinical academic staff in the British schools is approximately 1.5 : 1. The one exception is Edinburgh; it is the reverse of the other schools with a Clinical/ Paraclinical(B.S.) academic staff ratio of 2.0 : 1. The U.S. Dept. of H.E.W. favours Clinical staff in a Clinical/ Paraclinical(B.S.) ratio of 1.7 : 1.

(2) All academic staff numbers/ Whole School area:

"Whole School area" includes the total area of the Clinical, Paraclinical, Preclinical (Newcastle only), and Central divisions. The ratio also includes routine areas ("S" designation at the left of Appendices Tables 7 to 12),
Total academic staff numbers are used in the calculations.

The average density is 1150 sq.ft./ full-time staff member; for the U.S. Dept. of H.E.W. it is 1020 sq.ft./ staff member. All of the schools examined are closely distributed around the average, Edinburgh being the lowest at 1000 sq.ft./ staff member. Edinburgh has a very big Clinical staff complement by comparison with the other schools.

(3) All academic staff numbers/ all research area.

The ratio includes all of the areas designated "R" in the Appendices Tables 7 to 12, plus the Central Laboratory areas (animal house, electron microscope suite, etc.). Total academic staff numbers are used in the calculations.

The average density ratio for the British schools is 759 sq.ft./ academic staff member; it is remarkably close to the ratio for the U.S. Dept. of H.E.W. (765 sq.ft.). Again, all schools are reasonably close to the average.

(4) Divisional academic staff numbers/ all divisional research area.

Ratios are based on the separate area totals for the Clinical, Paraclinical, and Preclinical (Newcastle only) divisions designated "R" in the Appendices Tables 7 to 12.
Separate academic staff numbers for each division are expressed as ratios of the respective division research areas.

The ratio averages are: Clinical 707 sq.ft./ staff member, Paraclinical 575 sq.ft. U.S. Dept. of H.E.W: Clinical 545 sq.ft./ staff member, Basic Science 820 sq.ft.

(5) Divisional academic staff numbers/ divisional research laboratory area:

Ratios are based on the general research laboratory areas in each division. Separate academic staff numbers for each division are expressed as ratios of the respective division research laboratory areas.

The ratio averages are: Clinical 360 sq.ft./ staff member, Paraclinical 331 sq.ft. U.S. Dept. of H.E.W.: Clinical 325 sq.ft./ staff member, Basic Science 580 sq.ft. Although the Clinical and the Paraclinical averages are fairly close, there is a considerable variation between the schools; in 3 British schools the Paraclinical ratio is higher than the Clinical ratio, and in 2 schools the reverse is the case. Edinburgh shows a wide differential in favour of Paraclinical, Wales, on the other hand, shows an even wider margin in favour of Clinical. It is interesting to note that Newcastle's Paraclinical and Preclinical ratios are almost identical. From the figures for the British schools, it is difficult to actually state which division is likely to require more research laboratory area per staff member. For the U.S. Dept. of H.E.W. there is a decided emphasis in favour of Basic Science staff, the Basic Science staff density ratio being almost twice that of Clinical. That the Clinical and the Paraclinical ratio averages for the British schools are close, and, that the ratios for two of these schools - Newcastle and St.Andrews - show only a small differential between Clinical and Paraclinical, it might suggest that the provision should be about equal per staff member in both divisions. However, there is little other basis for this assumption.

(6) All academic staff numbers/ all research laboratory area:

Ratios are based on the total general research laboratory areas. Total academic staff numbers are used in the calculations. The average ratio for the British schools is 396 sq.ft./ staff member; for the U.S. Dept. of H.E.W. it is 543 sq.ft.

Wales' ratio is the lowest for all schools. The school's ratio for All academic staff numbers/ all research area (3) compares reasonably with the other schools, and the low figure for All academic staff numbers/ all research laboratory area indicates that much of the area designated "R" in the Appendix table is not, in fact, general or actual research laboratories. A large proportion of this accommodation would be offices in keeping with the high"Office" percentage shown in the school's Divisional Structure table (Table 18).

The ratios for Newcastle and the U.S. Dept. of H.E.W. are close. St.Andrews has by far the highest ratio, and it is a confirmation of the high percentages shown by the school in the Divisional Structure table (Table 20); also,of the fact that this school places considerable emphasis on research and its accommodation.

(7) All academic staff numbers/ all laboratory area:

Ratios are based on all general laboratory areas (research"R", and service "S"). Total academic staff numbers are used in the calculations. It is realized that the service laboratories (included in with research laboratories in this analysis) are manned by many staff other than academic, and, that the corresponding ratios will give no indication of the actual amount of service laboratory area available per user. The purpose of this table is to give some indication of how much laboratory area is provided in each medical school, additional to that of research laboratories.

By comparison with its low ratio for All academic staff numbers/ all research laboratory area (6), Wales shows a much improved ratio for All academic staff numbers/ all laboratory area (7). The inference is, that there could be a higher proportion of service laboratories in this school than in the other schools examined. The margin between the ratios for (7) and (6) is the widest for Wales. The following are the medical schools ranked in order of this difference: Wales 165 sq.ft., St.Andrews 150 sq.ft., Sheffield 147 sq.ft., Edinburgh 135 sq.ft., Newcastle 70 sq.ft. (80 sq.ft. if the Preclinical division is excluded), U.S. Dept.of H.E.W. 32 sq.ft. It can be seen that the two "Full Curriculum" schools provide much the smallest amount of"Service"by this reckoning; for the U.S. Dept. of H.E.W. the difference between (7) and (6) is almost negligible.

In Table 24, the medical schools are ranked numerically according to their provision for (i) percentage of General Laboratories for the Whole School (Divisional Structure Tables 17 to 22), (ii) the ratio amounts for All academic staff numbers/ all research laboratory area (6), and (iii) the ratio amounts for All academic staff numbers/ all laboratory area (7). From these comparative rankings it can be seen that there is a general tendency for schools with high laboratory area percentages to also provide more liberal ratios of research and all laboratory area/ academic staff member. This is especially noticeable for the "Clinical" schools (Table 24b).

TABLE 24

Comparative ranking orders of medical schools for:
(i) percentage of General Laboratories for the Whole School (Divisional Structure Tables 17 to 22),
(ii) the ratio amounts for All academic staff numbers/ all research laboratory area (6), and
(iii) the ratio amounts for All academic staff numbers/ all laboratory area (7).

a.	(i) General Labs. as % of Whole School area	(ii) Ratio of All academic staff nos./ all research lab. area (6)	(iii) Ratio of All academic staff nos./ all lab. area(7)
Edinburgh	3 (38.8%)	5 (350 sq.ft./ staff member)	5 (485 sq.ft./ staff member)
Wales	4 (32.2%)	6 (320 sq.ft.)	5 (485 sq.ft.)
Sheffield	2 (42.5%)	4 (473 sq.ft.)	2 (620 sq.ft.)
St.Andrews	1 (45.0%)	1 (640 sq.ft.)	1 (790 sq.ft.)
Newcastle	6 (31.6%)	3 (510 sq.ft.)	3 (580 sq.ft.)
U.S. Dept. of H.E.W.	5 (34.4%)	2 (543 sq.ft.)	4 (575 sq.ft.)

b. "Clinical" schools only			
Edinburgh	3	3	3
Wales	4	4	3
Sheffield	2	2	2
St.Andrews	1	1	1

Newcastle and the U.S. Dept. of H.E.W. provide the smallest percentages of general laboratories in the Divisional Structure tables, but a better indication, and a fairer comparison with the "Clinical" schools, is given by the schools' ratio allowances of All research laboratory area (6) and All laboratory area (7) / academic staff member. Apart from St.Andrews, the two "Full Curriculum" schools have higher ratios than the "Clinical" schools.

STUDENTS:

Undergraduate Medical Students: Criteria in Chapt. 2 suggests that their numbers should be relatively stable throughout the normal life of a medical school (unless there is a planned expansion for the future). The figures supplied by the medical schools in their schedules of accommodation are, therefore, likely to remain fairly constant into the forseeable future.

Postgraduate Students: Their numbers must increase. The requirements for postgraduate teaching accommodation should not make excessive demands on medical school area but they will need to be much improved on the present allocation in most medical schools.

STUDENT RATIOS:

Based on the student numbers and the medical school teaching areas listed in Appendix 28, a number of ratios are provided in Table 25. The following headings are used in the table (a brief discussion will also be made on the figures under each of these headings):

TABLE 25 Student ratios. Source: Appendix 28

	(1) All student numbers/ total teaching area	(2) All med. student numbers/ all teaching area	(3) Under-grad.med. student numbers/ all teaching area	(4) Under-grad. student numbers/ academic staff member	(5) Under-grad./ post-grad. medical students	(6) Teach. hosp. bed numbers/ "Clin." under-grad.
Edinburgh		106 sq.ft./ student	153 sq.ft./ student	1.6 : 1	2.3 : 1	1.9 : 1
Wales	55 sq.ft.	85 sq.ft.	120 sq.ft.	2.9	2.4	2.8
Sheffield	64 sq.ft.	83 sq.ft.	121 sq.ft.	3.6	2.2	2.9
St.Andrews	97 sq.ft.	138 sq.ft.	177 sq.ft.	2.9	3.5	2.7
Newcastle	114 sq.ft.	164 sq.ft.	197 sq.ft.	2.7	3.0+	3.5
U.S. Dept. of H.E.W.		187 sq.ft. (Sch. 1) 169 sq.ft. (Sch. 2)	234 sq.ft. (Sch. 1) 212 sq.ft. (Sch. 2)	2.8	3.9	3.9

+ This excludes the Preclinical division. The ratio is 5.5 : 1 for the Whole School

(1) All student numbers/ total teaching area:

"All student numbers" (in addition to undergraduate and postgraduate medical students) may include science, dental, or any other students taught in the medical school - depending on the particular school. The numbers are only given by 4 schools and even in these schools the amounts of occupation are not very clearly defined. Too great a store, therefore, should not be attached to the respective density ratios. Newcastle has the highest ratio as might be expected with its "Full Curriculum" structure.

(2) All medical student numbers/ all teaching area:

The ratio includes undergraduate and postgraduate medical students and it constitutes a better basis of comparison than that of (1). The two "Full Curriculum" schools, as suggested earlier by their proportions of teaching accommodation in the Divisional Structure tables, provide by far the highest ratios of teaching area/ medical student. It is interesting to note that Newcastle and the American hypothetical school Type 2 (each schedules multidiscipline laboratories) are very close in their ratio amounts of teaching area/ student. St.Andrews provides a very good ratio for the "Clinical" schools.

For the hypothetical schools of the U.S. Dept. of H.E.W., both School 1 (traditional laboratories) and School 2 (multidiscipline laboratories) accommodate the same number of students (and staff). The only difference between the two schools occurs in their respective teaching emphasese in the Basic Science and the Central divisions, and as such, School 2 effects a total saving of 8290 sq.ft. (net). As shown in Table 25, the medical student density for School 1 is 187 sq.ft./ medical student and for School 2 it is 169 sq.ft./ medical student:[1] it represents a saving of 18 sq.ft./ student. The U.S. Dept. makes no attempt to advocate one school in preference to the other; presumably it puts forward the two types on the basis of them both providing a good teaching environment. If this be so, it can be seen that School 2 , with no apparent falling off in teaching standards, is a more economical solution by area. It supports the earlier premise on the desirability of shared and centralized teaching facilities.

(3) Undergraduate medical student numbers/ all teaching area:

These ratios indicate little more than do those of (2). Edinburgh shows an improved ratio by comparison with the other British schools although this is only by a small amount.

(4) Ratio of undergraduate medical students/ academic staff member:

The average ratio for the British schools is 2.7 : 1; for the U.S. Dept. of H.E.W. it is 2.8 : 1. All schools are fairly close to the average which is almost identical to that of the American hypothetical school. The average for the British schools represents almost a doubling of the ratio of 5.6 : 1 determined by Robbins (see Table 1) and it supports an earlier postulation that academic staff would increase their numbers "in the future". Even in the schools analysed, it can be assumed that their staff numbers will continue to rise above those scheduled at present.

1. The U.S. Dept. recommends,as an optional extra, the provision of study cubicles for all medical students - Basic Science and Clinical. If cubicles are not used (they are scheduled only for Basic Science in Appendix 12), the ratios become 167 sq.ft./student and 149 sq.ft./ student for Schools 1 & 2 respectively.

(5) Ratio of undergraduate/ postgraduate medical students:

The average ratio for the British schools is 2.7 : 1; for the U.S. Dept. of H.E.W. it is 3.9 : 1. All schools are reasonably distributed around the average. Of the "Clinical" schools, St.Andrews shows the smallest ratio of postgraduates,which is a little surprising in view of the school's emphasis on research, and good provision of research laboratories and teaching accommodation.

(6) Ratio of teaching hospital beds/ undergraduate "Clinical" student:

The average for the British schools is 2.8 : 1; for the U.S. Dept. of H.E.W. it is 3.9 : 1. The British average is similar to the average (for all of the English Provincial medical schools) which was determined in Chapter 2 (Table 16). There is, thus, no noticeable trend to increase, or to decrease, the number of teaching beds/ student (parent hospital only). The U.S. Dept. of H.E.W. recommends a parent hospital of 500 - 700 beds: at 700 beds, the hypothetical school would provide a very good ratio of 3.9 : 1 for medical students in the Clinical years.

DISCUSSION

Table 26 gives chart summaries of the findings from the previous observations on the Divisional Structure and Category Apportionment tables. Figures in the tables provide the average and mean percentages. Where schools show a precise agreement on a category, it is marked with an asterisk (+); if there is wide or general disagreement on a category, it is marked with a question mark (?). In some instances it is not possible to establish a mean or an average and the space is left blank.

In the Divisional Structure Chart (Table 26a), it can be seen that in the majority of categories the average is greater than the mean. If it can be assumed that the majority of schools, which are included in the means, have normally provided adequate accommodation for their needs, it might be supposed that the remaining schools - which have been disregarded in each of the mean reckonings - have, in the main, tended towards excess rather than underprovision of one category or another. In seeking an explanation for this tendency, there are three possibilities which seemingly present themselves:

1. Some schools specialize in a particular medical school aspect - teaching research, etc. - and they require additional accommodation for the satisfactory fulfilment of work on this aspect.
2. If there has been uncertainty as to the adequate amount of accommodation that should be made for a category, it has been considered better to veer on the side of "safe" provision.
3. Excess demands have been made on accommodation for reasons or prestige or something similar.

A minority of Divisional Structure summary percentages in Table 26 show the means to be greater than the averages, suggesting, that there has been an underprovision of category accommodation by the school or schools which have been discounted from the mean reckonings. These will be discussed later.

The percentages in the Category Apportionment summary chart are, perhaps, less significant. For Workshops, Stores, and possibly Staff Amenities, they tend to confirm discrepancies which are apparent in the Divisional Structure tables, but they are not sufficiently big enough to provide accurate apportionment figures. Offices, Laboratories, and Teaching areas are more precise, and the percentages indicate a general conformity by the British schools in the ratios of their Clinical, Paraclinical(B.S.), and Central divisions to the respective Whole School category divisions.

Table 27 gives chart summaries of the schools at the maxima and minima of the Divisional Structure and the Category Apportionment ranges. The school/s which have been discounted in each of the mean reckonings are underlined. For the category "Teaching", in the Divisional Structure summary chart, the highest "Clinical" school is provided in addition to Newcastle which, as might be expected, provides the highest "Teaching" percentage in the Paraclinical(B.S.), Central, and Whole School divisions due to the inclusion of "Preclinical".

TABLE 26 Summary Tables of Divisional Structure and Category Apportionment average and mean percentages for the British medical schools discussed in this chapter.

a. DIVISIONAL STRUCTURE

		Offioes	Labs.	Suppl. lab. accom.	Anc. labs.		Wkshps	Stores	Miscl.	Teach.	
CLINICAL	Av.	28.8	39.5	2.0	5.5	47.1	3.4	6.9	6.6	7.2	100.0
	Mn.	31.4	39.5	-	-	43.6	3.4+	8.2	6.6?	5.5	98.7
PARACLINICAL (Basic Science)	Av.	15.9	35.0	5.2	4.7	44.9	1.9	7.9	5.7	23.7	100.0
	Mn.	13.9	33.8	-	-	44.4	2.0+	7.1	7.2	20.7+	95.3
CENTRAL	Av.	7.8	-	-	-	24.1	4.4	2.0	19.8	43.2	101.3
	Mn.	4.3	-	-	-	28.2	5.5?	2.0?	19.8	40.4+	100.2
WHOLE SCHOOL	Av.	16.1%	32.0%	2.8%	3.2%	38.0%	2.9%	5.3%	10.9%	26.7%	99.9%
	Mn.	14.0%+	35.8%	-	-	42.1%	3.2%	5.0%	10.6%	23.9%	98.8%

b. CATEGORY APPORTIONMENT

		Offioes	Labs.	Suppl. lab. accom.	Anc. labs.		Wkshps	Stores	Miscl.	Teach.	
CLINICAL	Av.	41.2	26.1	-	-	26.1	?	?	?	6.0	21.6%
	Mn.	34.7	26.1	-	-	26.1+	?	?	?	4.2+	20.5%+
PARACLINICAL (Basic Science)	Av.	45.1	48.6	-	-	52.6	?	?	?	39.6	44.8%
	Mn.	48.9	46.0	-	-	50.2+	?	?	?	42.8	42.2%
CENTRAL	Av.	13.7	25.3	-	-	21.2	?	?	?	54.4	33.5%
	MN.	16.5	28.1	-	-	23.7+	?	?	?	49.9	34.5%
	Av.	100.0	100.0	-	-	99.9	?	?	?	100.0	99.9%
	Mn.	100.1	100.2	-	-	100.0	?	?	?	96.9	97.2%

\+ Schools show a precise agreement.

? Some disagreement by schools.

TABLE 27 Summary charts of medical schools at the maxima and minima ranges of Divisional Structure and Category Apportionment percentages .

		Offices	General labs.	Actual labs.	Wkshps	Stores	Miscl.	Teach.	Whole School
a. DIVISIONAL STRUCTURE	+	Edinb.	St.And.		Wales	St.And.	Edinb	Wales	
	-	St.And.	Edinb.		Sheff.	Sheff.	Wales	Sheff.	
PARACLINICAL (Basic Science)	+	Wales	St.And.		Newcl.	Edinb.	Wales	Newcl. (St.And)	
	-	St.And.	Wales		Sheff.	Newcl.	St.And	Wales	
CENTRAL	+	Wales	Edinb.		Sheff.	Edinb.	Edinb.	Newcl. (St.And)	
	-	Edinb.	Wales		Newcl. St.And	Newcl. St.And Wales	Sheff	Edinb.	
WHOLE SCHOOL	+	Wales	St.And.		Sheff.	Edinb.	Edinb.	Newcl. (St.And)	
	-	St.And.	Newcl. Wales		St.And	Newcl.	Wales	Edinb.	
b. CATEGORY APPORTIONMENT									
CLINICAL	+	Edinb.	Edinb.	Sheff.	?	?	?	Wales	Edinb.
	-	Wales	Newcl.	Newcl.				Sheff.	Newcl.
PARACLINICAL (Basic Science)	+	Wales	Wales	Wales	?	?	?	Wales	Wales
	-	Edinb.	St.And.	Newcl.				St.And	St.And.
CENTRAL	+	Wales	Newcl.	Newcl.	?	?	?	St.And	St.And.
	-	Edinb.	Wales	Wales				Wales	Wales

+ Range maximum

- Range minimum

The school which is discounted in the mean reckoning is underlined.

EDINBURGH:

Area Study (Table 17):

Edinburgh's greatest disparity with the other schools occurs in the Clinical departments, and in particular, the school's very high percentage of Clinical Offices; the discrepancy is apparent in both the Divisional Structure and the Category Apportionment tables. In the school's Divisional Structure Table 17a, Offices assume 67.4% of the total Clinical area. In the Category Apportionment Table 17b, it can be seen that the whole Clinical division is approximately $\frac{3}{4}$ of the size of the whole Paraclinical(B.S.) division whereas Clinical Offices are 3 times the size of those for Paraclinical(B.S.). In seeking an explanation for Edinburgh's Clinical Office discrepancy, it may be necessary to have regard to the school's background tradition. The Edinburgh medical school is the Clinical reference centre for the region, and it has a long standing tradition of Clinical service. The teaching hospital is to be redeveloped,in stages, on the present site as the existing buildings are demolished,and,with one or two additions and/or other exceptions, the same medical school departments will be incorporated in the new building. Despite the planning problems arising out of redeveloping the teaching hospital on the same and somewhat restricted site, the actual demand for change is possibly less for Edinburgh than for the other British schools examined, all of which are required to change their location. It might be expected, therefore, that much of Edinburgh's Clinical tradition will be passed on, including the "inherited" Offices which are a legacy of the school's traditional Clinical administrative responsibilities to the region.

The large provision of Clinical Offices in the Edinburgh medical school also affects the total size of the Clinical area which is larger by percentage (and area) than what is otherwise a very consistent Clinical mean provided by the other British schools.

Edinburgh also provides a higher overall percentage for Divisional Structure "Miscellaneous". Much of this category pertains to staff amenities (reading room, library, change rooms, etc.). The comparatively high percentage is not surprising due to the departments of this particular medical school being generally larger than those of the other schools examined, with a greater likelihood that large departments would provide individual departmental facilities.

Staff Ratios (Table 23):

Edinburgh is the only British medical school which schedules more Clinical than Paraclinical staff; it is in keeping with the former remarks on the school's Clinical bias. The research area for the Clinical division is more than double the size of the next biggest school (see Appendix 27), although as shown by its Staff density ratio in Table 23 (4), the actual ratio of Clinical research area/ academic staff member is less for Edinburgh than for any other school. It suggests either an underprovision of research accommodation, or, that there are too many staff for the Clinical research accommodation available (this is only based on the assumption that medical school academic staff are all engaged on some form of research).

Student Ratios (Table 25):

The school has an annual intake of 150 medical students. This figure represents a reduction of around 50 from the prewar and the immediate post-war years, although it is still about 50 above the general maximum annual intakes of all other British medical schools, except Glasgow. Despite the large number of students in the Edinburgh medical school, the ratio of teaching area per student compares favourably with the other British schools examined.

In view of its overall size, it would be difficult to "model" another medical school on Edinburgh unless there is to be a revision of present opinion as to the maximum size that a medical school should be.

Edinburgh's "Student Clinical Laboratory" promises of being a valuable contribution to medical teaching, for, not only the Edinburgh medical school but, other medical schools in this country who are investigating new types of medical school accommodation in connection with their revised curricula programmes. Since the issue of the Edinburgh Schedules of Accommodation (31st January, 1964), there has been some suggestion that this laboratory is not , in fact, to be provided. It is to be hoped that this worthwhile proposal will not be scrapped on financial grounds.

WALES

Area Study (Table 18):

Office provision for all of Wales' Divisional Structures is high. By way of contrast, the school's Divisional Structure Laboratory percentages are generally the lowest for all of the "Clinical" schools examined. In the Category Apportionment summary chart (Table 27b), it can be seen that Wales and Edinburgh are at the extremes of the "Office" range in all divisions.

Hospitals in the Cardiff area (United Cardiff Hospitals) are somewhat scattered and it is intended, with hospital redevelopment, "....to create a number of large hospitals in which the majority of specialties can be concentrated."(1) The proposed, and entirely new, teaching hospital and medical school is the major scheme for the region which will, when completed, centralize a number of specialties. At the same time it will serve as the regional administration centre. The new teaching hospital, in its capacity as administrator, will probably require a higher proportion of offices than the other teaching hospitals which are associated with the medical schools discussed in this chapter.

The pattern of Wales' Clinical, Paraclinical, and Central Teaching Apportionment differs from that of the other British schools. In all schools, the highest percentage for Teaching occurs in the Central division whereas for Wales, the Teaching percentage is the highest in the Paraclinical(B.S.) division. Wales shows the highest Clinical Teaching Apportionment of the medical schools examined.

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1. A Hospital Plan for England & Wales, p.p. 258.

Staff Ratios (Table 23):

A comparatively low percentage for General Laboratories in its Divisional Structure table is reflected in a staff density ratio for All academic staff numbers/ all research laboratory area (6) which is the lowest for the British schools. Wales' ratio for All academic staff numbers/ all laboratory area (7) (including service laboratories) is much improved over that of (6), although the ratio is still one of the smallest. The very generous provision of Offices in Wales is seemingly at the expense of Laboratories, a factor which tends to cut across the present trends in respect of the rapid growth and of the importance of laboratory research in medical schools.

Student Ratios (Table 25):

By comparison with the other schools, Wales' ratio of teaching area per student is low. As for the remarks on research accommodation, it is questionable if the amount of teaching accommodation is enough to satisfy the needs of the school's scheduled student complement. Even if it were to be assumed that the undergraduate student numbers will not increase, the scope for postgraduate development appears to be restricted on two counts: teaching and research.

SHEFFIELD

Area Study (Table 19):

The outstanding pattern emerging from Sheffield's area structure occurs in respect of its Workshops. In the Divisional Structure and the Category Apportionment tables the school's "Workshop" percentages are the smallest; conversely, they are the highest in the Central divisions of both tables. There is an obvious emphasis on centralized Workshop facilities in the school.

As may be seen by its general absence from the Table 27 Summary Chart, Sheffield conforms to the average and mean patterns produced by the British medical schools more than any other school examined; in only one or two minor instances have its percentages been rejected in the mean reckonings.

Staff Ratios (Table 23): In a similar vein, all of Sheffield's staff ratios occur somewhere in the middle range. The school provides a good staff density ratio for All academic staff numbers/ all laboratory area (7).

Student Ratios (Table 25):

Sheffield's student density ratios are somewhat low by comparison with the other schools examined. Like Wales, a similar question might be posed in respect of the adequacy of Sheffield's teaching accommodation. The school has the lowest ratio for postgraduate students, and the available teaching area does seem likely to restrict the type of postgraduate expansion that was advocated for British medical schools in Chapter 2.

ST.ANDREWS

Area Study (Table 20):

As shown in the Table 27 summary chart, St.Andrews is at variance with the Divisional Structure and Category Apportionment means in several instances. However, there is in this variation a general pattern which is not so consistently apparent in the other schools examined.

In the Divisional Structure tables, St.Andrews Office percentages for Clinical, Paraclinical(B.S.), and the Whole School are the smallest for all schools (Central Offices also make up a negligible percentage). Laboratories in these same divisions are the highest for all schools (the Central Laboratory percentage is also one of the highest). Of the "Clinical" schools, St.Andrews provides the highest percentage for Teaching in the Paraclinical(B.S.), Central, and Whole School divisions.

In the Category Apportionment tables, St.Andrews Teaching percentage is the lowest in the Paraclinical(B.S.) division; this occurs despite the school's Teaching percentage for the Paraclinical(B.S.) division in the Divisional.Structure table being the highest for the "Clinical" schools. It serves to emphasize the size of St.Andrews' Central Teaching Apportionment which is the biggest of the "Clinical" schools examined, and also to underline the school's concentration on shared and centralized teaching facilities.

In summary, therefore, the pattern that emerges for the St.Andrews medical school is:

1. A low percentage of office accommodation.
2. A high percentage of laboratory accommodation.
3. Concentration on centralized teaching accommodation.
4. A general emphasis on central and shared facilities.

As office accommodation is essential for the efficient operation of laboratories, the preliminary indications are that 1. and 2. are contradictory (this does not include administrative offices, although these too tend to be smaller in total than those of the other schools examined). Figure 14 shows a standard laboratory unit and the layout which is generally adopted in St.Andrews laboratory and research area (the size of the unit is 25'0" x 11'1½"). The laboratory unit and general office/ laboratory layout are based on the results of studies which were carried out by the Division for Architectural Studies of the Nuffield Foundation. From anthropometric and other data, the Foundation established that a laboratory room unit 24ft. to 30ft. long and from 10 ft. 6 in. to 12 ft. wide (floor area between 252 and 360 sq.ft.) "could provide efficient accommodation for a team of three workers in most scientific disciplines".(1) In regard to laboratory office areas, the Nuffield study, in discussing the various merits of different types of layouts, put forward a "compromise solution .. by planning very small offices, no larger than cubicles, directly adjoining the laboratory ... a small area, perhaps as little as 50 sq.ft."(2)

In the illustration of St.Andrews' laboratory and office layout, it can be seen that the arrangement is capable of future redevelopment and internal change without the necessity for wholesale internal disorganization of the existing accommodation.

1. The Design of Research Laboratories, p.p.50.
2. Ibid. p.p. 58.

Staff Ratios (Table 23):

In keeping with high percentages for laboratory accommodation in its Divisional Structure table, St.Andrews provides by far the best ratios for All academic staff numbers/ all research laboratory area (6) and for All academic staff numbers/ all laboratory area (7). The school should be able to increase its complement of staff engaged on research for some time before there arises the necessity of adding to the research laboratory complex. As shown in Fig. 17, the laboratory areas themselves are "open-ended" and are capable of future extension without unnecessary interference with other parts of the medical school and teaching hospital. The school also appears to be capable of providing good laboratory "service" in conjunction with its research laboratories.

Student Ratios (Table 25):

St.Andrews ratio of teaching area per student is the highest for the "Clinical" schools examined. Although the ratio for postgraduates is smaller than for any of the other British schools, it is not likely that an increase in their number would greatly reduce the teaching and research area ratios.

NEWCASTLE

Area Study (Table 21):

As anticipated at the outset, Newcastle's greatest variation occurs in connection with its Teaching areas. In the Divisional Structure tables, the school provides the highest percentage for Teaching in the Paraclinical(B.S.), Central, and Whole School divisions. Otherwise, the school's Divisional Structure percentages are below the respective Divisional Structure averages, and it indicates the presence of additional teaching areas that are required in the Preclinical division.

It is difficult to generalize on the figures for the Newcastle medical school as it is the only British "Full Curriculum" school studied. There has, however, been a number of indications throughout this chapter analysis to suggest that Newcastle, despite the "addition" of a Preclinical division, is on the whole in keeping with the pattern of the other British "Clinical" schools. For example, the school's Clinical division structure (which might be expected to be similar to the other schools as its areas are not directly affected by the "inclusion" of Preclinical) is very similar to the averages and means, as is the Clinical Apportionment total as a percentage of the Whole School. The total Clinical Apportionment was even closer to the "Clinical" school mean when an Apportionment study was made of the school without its Preclinical division. The Office and the Laboratory Apportionments for Newcastle also follow a similar pattern to the "Clinical" schools. Reference has been made frequently to the similarity in the area structures of Newcastle and the hypothetical medical school (Type 2) of the U.S. Dept. of H.E.W., and there does not appear to be any reason why the figures for Newcastle, and the U.S. Dept. with one or two possible exceptions, could not be taken as a"typical example" of a "Full Curriculum" medical school in this country.

Staff Ratios (Table 23):

These form a better basis of comparison with the "Clinical" schools than do the area percentages only. For the ratio All academic staff numbers/ whole school area (2), Newcastle is around the middle of the range; for All academic staff numbers/ all research laboratory area (6), the school is better than most, and if Preclinical staff numbers and departmental areas are excluded in this ratio, it is even higher, being second only to that of St.Andrews. There is not a significant increase over (6) for the ratio All academic staff numbers/ all laboratory area (7). As shown in Table 23, the inclusion of a Preclinical division is one of the reasons for this comparatively small ratio increase, but even without the Preclinical division, it is not of the same order of magnitude as the respective ratio increases shown by the "Clinical" schools. The U.S. Dept. of H.E.W. shows an even smaller increase of (7) over (6), and it is apparent that both of these "Full Curriculum" schools place less emphasis on the service aspect than do the "Clinical" schools (see Appendix 26).

Student Ratios (Table 25):

In keeping with high Divisional Structure teaching percentages, the student density ratios for Newcastle are well above the "Clinical" schools; in this respect, only the figures of Newcastle and the U.S. Dept of H.E.W. are really comparable - Newcastle 164 sq.ft./ medical student, U.S. Dept. of H.E.W. School 2 169 sq.ft./ medical student (both schools provide multidiscipline laboratories).

The discrepancy noted earlier between the Central Teaching Apportionment for Newcastle (57.4%) and the U.S. Dept. of H.E.W. (68.2%) suggests either, that the U.S. Dept. is overproviding Central Teaching accommodation, or, that Newcastle is short on this facility. It is probable that the latter is so: the allowance of 50 sq.ft./ student in Newcastle's schedules for multidiscipline laboratories was stated as being "arbitary" (p.p. 155), and, going on the areas provided for multidiscipline laboratories by some American medical schools (see Appendix 31) it is very probable that the figure for Newcastle will have to be increased.

The Paraclinical(B.S.) Category Apportionment Teaching percentages for the same two schools are also widely separated. Newcastle's seemingly high figure could indicate some uncertainty as to the proper amount of Paraclinical(B.S.) teaching accommodation that should be provided in conjunction with multidiscipline laboratories, with a tendency to overprovide.

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Area Study (Table 22):

In its Category Apportionment table, the hypothetical school shows a very high percentage for Clinical Offices; only Edinburgh provides a higher figure. Unlike Edinburgh however, the American school's Category Apportionment Laboratory percentage is also well above the British average. It is apparent that the American school places more emphasis on Clinical research than do the British schools, and it is one of the most noticeable differences between the medical schools of both countries.[1] Otherwise, the U.S. Dept. school adopts an area pattern which is similar in many respects to that of Newcastle.

Staff Ratios (Table 23):

The Clinical research aspect is hightened by the U.S. Dept's. greater number of Clinical staff, in a Clinical/ Basic Science staff ratio of 1.7 : 1. A notable feature of the hypothetical school is that, despite a ratio which is the second smallest for All academic staff numbers/ whole school area (2), its ratio for All academic staff numbers/ all research laboratory area (6) is well above the British average. It indicates a high concentration on laboratory research. By the same token, the ratio for All academic staff numbers/ all laboratory area (7) is little above that of (6), suggesting that much of this "research" is "basic" in preference to "service".

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1. A publication "The Finance of Medical Research" (Office of Health Economics) states that the United States spends 15 times as much as Britain on medical research. (from the Times, Wed. June 10,1964, p.p. 7.)

Student Ratios (Table 25):

By comparison with the British schools, the U.S. Dept. of H.E.W. appears to provide a very generous teaching area allowance for its medical students, although the ratio for postgraduate/ undergraduate students is low. School 2 gives a saving in teaching area of 18 sq.ft. per student over School 1 by virtue of central multidiscipline teaching laboratories.

In summary, the major differences between the hypothetical medical school of the U.S. Dept. of H.E.W. and the British medical schools examined appear to be: for the American hypothetical school:

1. Greater emphasis on Clinical research.
2. A smaller amount of "service" provision in the Paraclinical(B.S.) departments, or alternatively, a greater concentration on Paraclinical(B.S.) "basic" research (SeeAppendix 26).
3. A more positive delimitation of teaching hospital and medical school activities, in contrast with the current British concept of integration or "embedding".

OBSERVATIONS ON TEACHING AREAS (See Appendices 19 to 24):

CLINICAL DIVISION:

Clinical apprenticeship and the type of teaching employed in Clinical departments has already been outlined. The bulk of Clinical instruction is received in the teaching hospital, although, there may be occasion to carry out some teaching in the actual Clinical medical school department.

Seminar Rooms:

These are sized in accordance with their intended use and the number of students that they will be required to accommodate. The sizes of seminar rooms in the medical schools examined range between 200 and 750 sq.ft.. It would seem from this that a seminar room between 250 and 350 sq.ft. could satisfy most Clinical departmental requirements (the U.G.C. recommends an area allowance of 20 sq.ft. per person - see Appendix 6).

St.Andrews adopts a layout incorporating professor's office and laboratory, secretary, waiting area,and seminar room (286 sq.ft.). It makes up a suite of rooms which have been generally standardized in the medical school (see Fig. 11).

General:

There is no other common type of Clinical teaching accommodation provided by the schools examined. Newcastle schedules a small teaching laboratory of 200 sq.ft. for Paediatrics; Wales schedules two such rooms of 250 sq.ft. for Obstetrics & Gynaecology, and Paediatrics.

The U.S. Dept. of H.E.W. allows for 2 Clinical lecture rooms, each 1380 sq.ft., accommodating 120 students. Wales also provides a Clinical lecture theatre of 1000 sq.ft. (plus patient waiting room 200 sq.ft., retiring room 100sq.ft., and projection room 100 sq.ft.)shared by medicine, surgery, and obstetrics & gynaecology.

PARACLINICAL(B.S.) TEACHING ACCOMMODATION:

Teaching areas for the Paraclinical(B.S.) departments are large and it is difficult to compare schools by area alone. For this reason, the Paraclinical(B.S.) teaching area categories have been reduced to percentages of the total teaching areas of the schools' Paraclinical(B.S.) divisions(see Table 28).

Paraclinical(B.S.) Seminars (and/or tutorials, and/or conference rooms):

St.Andrews percentage is very low and, if it is disregarded, the other schools provide a "Clinical" schools' mean of 18.2% (Newcastle's Paraclinical (only) percentage is used). The area of seminar accommodation in Newcastle's Preclinical division is similar to that of the Paraclinical division, although the Preclinical percentage for seminars is much lower due to there being such a large amount of other teaching areas in the division.

Paraclinical(B.S.) Teaching Laboratories:

It can be seen that almost all of St.Andrews Paraclinical(B.S.) teaching accommodation is teaching laboratories. If the school's very high percentage is disregarded, the other schools provide a mean of 67.7%. Newcastle's Paraclinical (only) percentage is used,

TABLE 28 Teaching structures, by percentage, for the Paraclinical(B.S.) division. Source: Appendices 19 to 24.

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. thrs.	Lect. thr. suppl.	Stores	Miscl.	
Edinburgh	5.0	20.2	59.3	3.0	3.9	1.8	1.1	5.7	100
	25.2		62.3		5.7				
Wales	11.3		78.9	1.0	8.0	0.8			100
			79.9		8.8				
Sheffield	22.6		46.2	2.0	15.9		2.8	10.5	100
			48.2						
St.Andrews	1.9	3.0	95.1						100
	4.9								
Newcastle Preclin.	5.1		77.9	4.5			4.6	7.9	100
			82.4						
Newcastle Paraclin.	13.6		79.6	2.0	3.2			1.6	100
			81.6						
U.S. Dept. of H.E.W. School 1	6.2		84.0	8.2			1.1	0.5	100
			92.2						
School 2	14.3		63.2	18.9			2.4	1.2	100
			82.1						

although as shown in Table 28, the percentages for Teaching laboratories in both divisions are almost the same.

Not all teaching laboratories are scheduled with supplementary accommodation. Based on the total areas of only those teaching laboratories for which supplementary laboratory accommodation is scheduled (4 British schools - St.Andrews not included[1]), supplementary laboratories make up 6.4% of the teaching laboratory total area ("Clinical" schools only - Newcastle's Preclinical departments are excluded in these reckonings). The ratio for Newcastle's Preclinical supplementary laboratories is 5.4%; for the U.S. Dept. of H.E.W., the Preclinical supplementary laboratory ratio is 8.9%.

Paraclinical(B.S.) Lecture Theatres:

Sheffield (15.9%) and Wales (8.8) provide the largest percentages, and in both of these schools lecture theatres (approximately 1000 sq.ft. each theatre) are shared by a number of Paraclinical(B.S.) departments. By far the greatest amount of lecture theatre accommodation is centralized in all schools. St.Andrews centralizes all of its theatres.

Paraclinical(B.S.) Teaching Stores:

For the Paraclinical(B.S.) division, 200 to 300 sq.ft. of teaching storage appears to suffice in the schools examined. Newcastle's figures infer that the Preclinical division is a greater user of teaching stores than the Paraclinical division.

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1. For St.Andrews, supplementary accommodation is scheduled in with teaching laboratories, but the schedules do not stipulate the actual area of this accommodation.

Paraclinical(B.S.) "Miscellaneous" Teaching Accommodation:

The largest amount of this accommodation pertains to departmental libraries and student amenities. Little can be learnt from the figures suffice to say that these two facilities are found more often in large departments.

CENTRAL TEACHING ACCOMMODATION

Medical schools vary in their types of Central teaching facilities. The most common of these are: lecture theatres, museums, and libraries.

Central Lecture Theatres:

Their size is governed by the anticipated maximum number of users (see Appendix 6 for U.G.C. suggested scales). 3 medical schools provide 3 central theatres, Edinburgh provides 6 theatres, Newcastle 4, and Wales 1 (this does not include one theatre of 1398 sq.ft. for the Clinical departments and one other theatre of 1000 sq.ft. for Path.).

All of the British medical schools provide one main lecture theatre. The sizes of these are as follows: Edinburgh 5190 sq.ft. (seating capacity 500), Wales 2500 sq.ft. (seating capacity 250); the other British schools all provide a main theatre of approximately 3500 sq.ft. (seating capacity 350).

Sheffield and Newcastle both provide an intermediate size theatre of 2190 sq.ft. (seating capacity 200); Newcastle provides two others of 1390 sq.ft. each (seating capacity 120); Sheffield also provides one theatre of 1000 sq.ft. After its main lecture theatre, St.Andrews provides two others of 1200 sq.ft. each (seating capacity 120 each).

Edinburgh's second theatre is 2690 sq.ft. (seating capacity 250); there are then two theatres, each of 2190 sq.ft. (seating capacity 200 each), and a fifth theatre of 1190 sq.ft. (seating capacity 100). Edinburgh also provides two "Clinical Demonstration" theatres of 790 sq.ft. each (seating capacity 60 each).

The U.S. Dept. of H.E.W. adopts a different policy, and its hypothetical school provides 2 Central and 2 Clinical lecture rooms of 1380 sq.ft. each (seating capacity 120 each), plus one other Central lecture room of 1020 sq.ft. (seating capacity 80). The use of 3 Central medium - small lecture lecture rooms (with no large lecture room) is questionable in an institution such as a medical school. As a part of a medical centre, there could be a number of occasions (conferences, conventions, etc.) when accommodation would be required in the medical school for a larger number of persons than 120.

In consideration of the use of closed circuit television (c.c.t.v.) in lecture theatres, a work study made by Robert Matthew, Johnson-Marshall & Partners on the implications of its use at Newcastle, found that an average of 220 sq.ft. would be required to provide adequate area for television demonstrations above that originally scheduled. The following are the additional allowances for c.c.t.v. in the lecture theatres at Newcastle:

3700 sq.ft. theatre	(seating 350)	-	400 sq.ft.
2190 sq.ft. theatre	(seating 250)	-	250 sq.ft.
1390 sq.ft. theatre	(seating 200)	-	200 sq.ft.

Figure 12 gives a typical working area for television demonstrations.

The following are the ancillary rooms scheduled in conjunction with the medical school lecture theatres examined:

1. Projection Room: 100 to 150 sq.ft. for small - medium theatres; 150 to 200 sq.ft. for medium - large theatres.

2. Patients' Ante Room: For its 500 seat auditorium Edinburgh provides an ante room of 400 sq.ft. accommodating 3 patients in bed plus 2 nurses. A room of 150 sq.ft. appears to be adequate for a 350 capacity lecture theatre.

3. Staff Ante Room: A room of approximately 150 sq.ft. may be required for a medium - large lecture theatre.

Museums:

Goodenough recommended that the Pathology and Anatomy museums could be grouped and centralized. The museum is, in effect, a demonstration area in which pathological and anatomical specimens are mounted for permanent and semi-permanent display.

Because of their preliminary nature, none of the medical schools' schedules gives a great deal of information on museum accommodation. 4 British schools provide a museum with an area of approximately 2500 sq.ft. Included in this area are museum ancillaries: preparation room/s, store/s, and a curator's room. For Newcastle, ancillary accommodation makes up 40% of the total museum area; for Sheffield, the ratio is a little higher at 47%. St.Andrews' pathological museum (2500 sq.ft.) is a corporate part of the main demonstration area; it is divided into 16 bays, 4 of which may be enclosed for use as tutorial rooms.

Library:

The design of a medical school library would constitute a study in itself and a complete analysis is not possible here. Again, information in the schedules of accommodation is very sketchy and data can only be given in the briefest of terms.

The U.S. Dept. of H.E.W. advocates a total library area of 23,350 sq.ft. housing 100,000 volumes.(1) Based on its net annual rate of accession, St.Andrews, in allowing for a 50 year period, estimates that space should be available for (1) 14,500 volumes in open shelves (6500 books, 8000 periodicals), and (2) 78,700 volumes in stacks (35,500 books, 42,000 periodicals). St.Andrews' library area is approximately 13,500 sq.ft., plus a two storey stack room with a floor area of 2100 sq.ft.

There are a number of components and ancillary rooms which are scheduled as being necessary for the functional efficiency of the medical library. The following are some of the more important of these:

Main Reading Area:The area contains open access book shelves, tables for general reading, and a central desk - with card catalogue. St.Andrews library provides for a total of 130 readers places (these are provided in carrels, research rooms, periodicals room, and a microfilm reading room). It is possible that, in addition to reading tables, study alcoves may be provided for students in the main reading area - these are small partitioned desks with a draw and reading light.

Periodicals Room: It may form a part of the main reading area, or it may occupy a separate room off the main reading area.

1. Medical School Facilities, p.p. 69.

Student Carrels and Reading Room: Carrels are small unenclosed reading areas with a desk and a reading light; the U.S. Dept. of H.E.W. recommends an area of 12 sq.ft. as being adequate.(1) They may occupy a section of the main library, or they could make up a series of units in a separate undergraduate reading room. St.Andrews uses a separate undergraduate reading room with 32 student places at reading tables, 8 study cubicles of approximately 36 sq.ft., and 4 study rooms, each, approximately 144 sq.ft. and accommodating 4 students. The U.S. Dept. of H.E.W. recommends one carrel for each 10 medical students in a school which makes no other provision for student reading, or, if no carrels are provided, a reading room accommodating 25% to 50% of the total undergraduate student body at 25 sq.ft. per student.(2)

Staff and Postgraduate Reading Room: These are small rooms, adjacent to the main library, provided for the purpose of reading and research by medical school staff and postgraduate students. The area may include one or two seminars for small group discussions or conferences.

Stack Room: It is provided for storing older volumes (say 10 years from the time of acquisition). Books in bulk are heavy and structural provisions will probably have to be made for stack room floors. St.Andrews provides a stack room of 2 storey height(at ground level) immediately below the main reading area.

Library Staff: Office and cloakroom accommodation is provided for a chief librarian, assistant/s, and secretary/s, plus a curator.

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1. Medical School Facilities, p.p. 69.
2. Ibid. p.p. 69 & 70.

Miscellaneous Library Accommodation: Additional rooms may be required for typing, film and slide projection, tape recording, microflim processing, book repairs and binding.

The following is a percentage breakdown based on the area recommendations of the U.S. Dept. of H.E.W. for a medical school library: public spaces 32.8%, staff offices 3.3%, work areas 2.8%, and storage areas 61.1%.

Miscellaneous Medical School Central Accommodation:

Seminars: Edinburgh (13 number) and Newcastle (6 number) both provide central seminar rooms for occasions when departmental seminar rooms may be fully occupied. 2 seminars in Edinburgh, and 3 in Newcastle are more than 500 sq.ft.,and as such, they might be classified as small lecture theatres.

Central Demonstration Area: In addition to its lecture theatres, Newcastle provides an Examination Hall. It is a multipurpose area of 3500 sq.ft. which may be used for lectures or demonstrations (150 students maximum), or for social functions. The Examination Hall is sited close to the student cafe, and meals may be served for up to 250 people.

St.Andrews provides a central demonstration area of 6400 sq.ft. made up of a series of standard bays, each 70 sq.ft., for purposes of frequently changing undergraduate and postgraduate exhibitions (48 bays - 300 sq.ft.), and for permanent exhibition (12 bays - 1000 sq.ft.). Additional ancillary accommodation (2400 sq.ft.) is provided for staff, preparation, and storage. Edinburgh also schedules an exhibition area of 6350 sq.ft., although the associated ancillaries (1350 sq.ft.) are less than those for St.Andrews' demonstration area.

Central Teaching Laboratories:

In consideration of the possible trend, as suggested in Chapter 2, towards small group teaching, Fig. 13 shows a plan and illustration of a type of traditional teaching laboratory which is recommended by the U.S. Dept. of H.E.W. as being able to meet the teaching needs of a whole class, and, at the same time being capable of division by folding screens for small group teaching. The U.S. Dept. considers that 16 students is a suitable teaching group. The laboratory would provide 44 sq.ft. per student, a figure which is very similar to the U.G.C.'s recommendation for First & Second Year Honours students (45 sq.ft./ student - see Appendix 6).

The multidiscipline laboratories and the student clinical laboratory scheduled by Newcastle and Edinburgh are too preliminary to provide any specific information, and laboratories of this type, therefore, can only be stated in terms of overseas and American experience. Appendix 31 gives some comparative student density ratios for the multidiscipline laboratories at Harvard, Southern California, Stanford, and Western Reserve medical schools. In consideration of the later discussion in Chapter 4, it would appear that an allowance of 56 sq.ft./ student, as provided by Southern California, would be suitable for a multidiscipline laboratory. This would be exclusive of supplementary laboratory accommodation (see Appendices 29 to 31).

SUMMARY CONCLUSIONS

The primary aim of this chapter has been to examine a number of medical schools with a view to establishing patterns of accommodation that may have become apparent in their area percentage structures (either in single schools or in school groups). These patterns have been related, in turn, to criteria discussed in Chapter 2 as they are relevant to present, and more important, to future medical school trends.

The medical schools examined in this chapter are of two types: (1) "Full Curriculum" schools, which provide all of the general subjects and the departments of the medical curriculum. These are all housed within or are immediately adjacent to the teaching hospital. (2) "Clinical" schools, whereby the "Clinical" (only) subjects are taken in the teaching hospital and the Preclinical subjects are taken at the actual university. The teaching hospital and the university are not necessarily sited adjacent to one another.

None of the schools examined can be nominated as "ideal", nor would this be possible as they all present their own parochial and particular problems of site, curriculum, research programmes, etc.

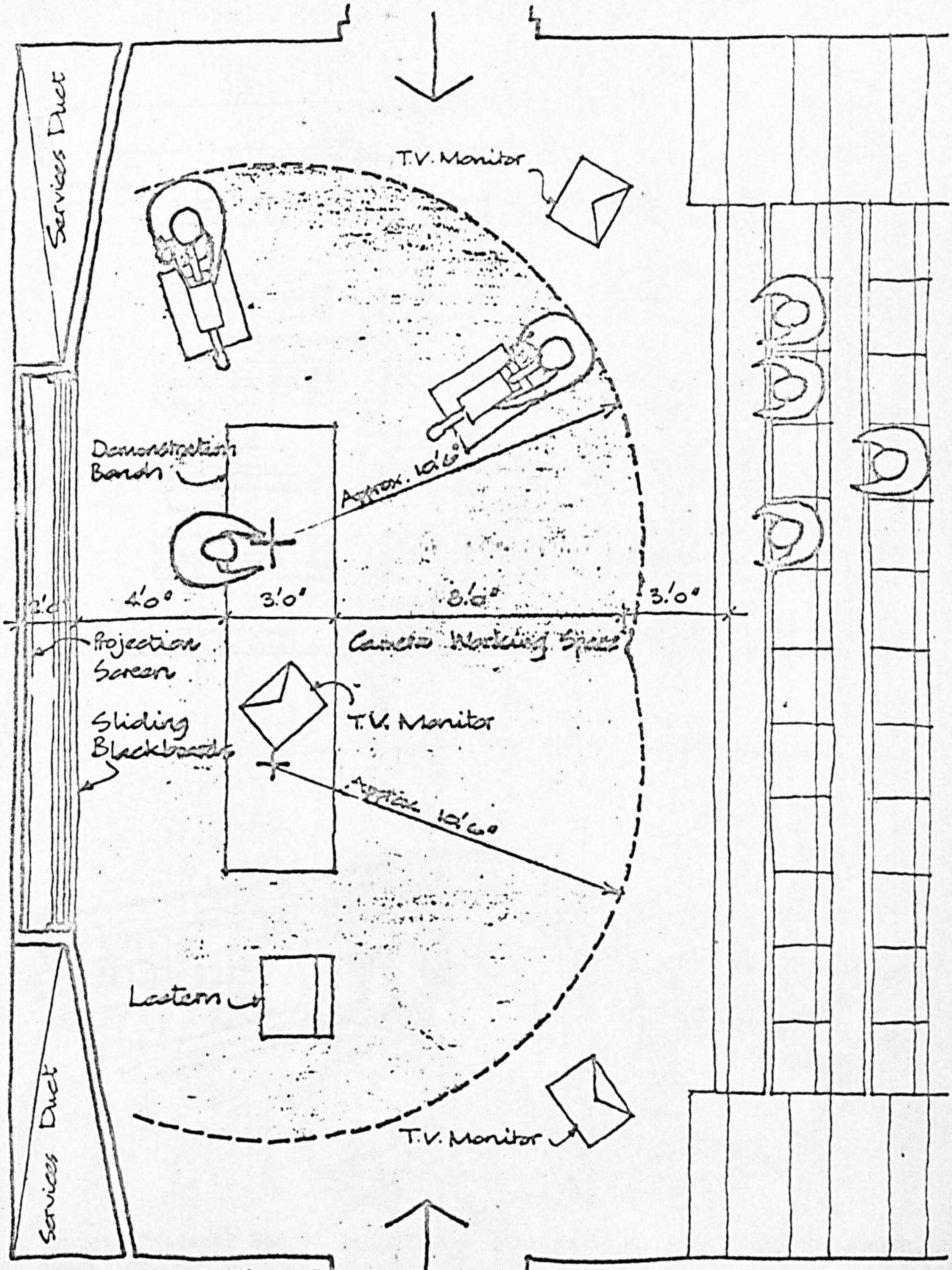
It is likely that new medical schools will be required in this country. If a new foundation is contemplated, strong consideration should be given to the provision of a "Full Curriculum" school, with teaching hospital, sited directly in relation to the university.

The proposed medical school at Newcastle embodies many desirable features of a "Full Curriculum" medical school. It is comprised of: Offices 13%, General Laboratories 32%, Workshops 2%, Stores 3%, "Miscellaneous" accommodation 12%, and Teaching accommodation (total) 38%. The basic divisions of the school are: Clinical 17%, Paraclinical 22%, Preclinical 21%, and Central accommodation 40%. For reasons given in this chapter, the Central apportionment might be a little low.
A hypothetical medical school recommended by the U.S. Department of Health, Education, and Welfare provides a Central apportionment of 45%.

Based on the mean averages determined from the medical schools examined in this chapter, a hypothetical British "Clinical" school would provide: Offices 14%, General Laboratories 42%, Workshops 3%, Stores 5%, "Miscellaneous" accommodation 11%, and Teaching accommodation 25%. The hypothetical school's basic divisions would be: Clinical 21%, Paraclinical 44%, and Central accommodation 35%. A proposed medical school for the Sheffield University conforms to this pattern more than any other school examined.

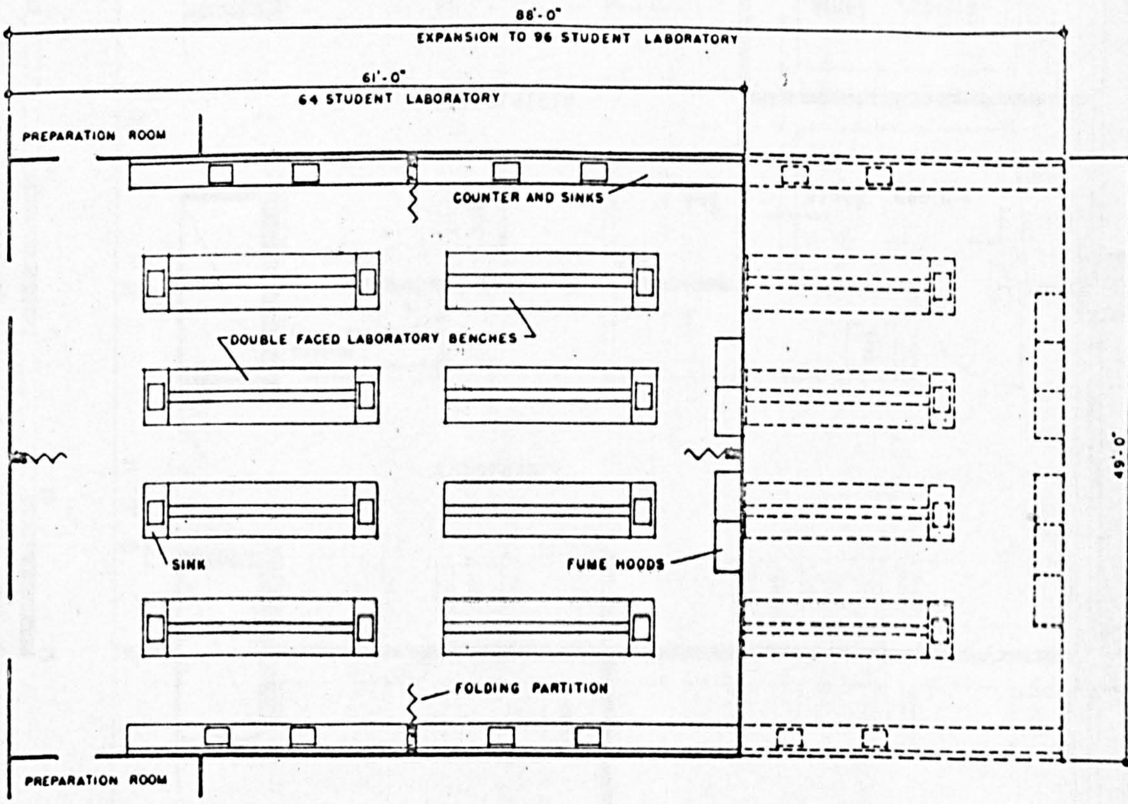
One "Clinical" medical school - St.Andrews University - stands out as providing "better than average" medical school accommodation, at the same time, observing important architectural requirements of economy through standardization and centralization. It appears to the the medical school which would be most capable of accommodating design criteria established in Chapter 2. Commendation should be given of the school's potential ability to accommodate future medical school developments, especially in the fields of research.

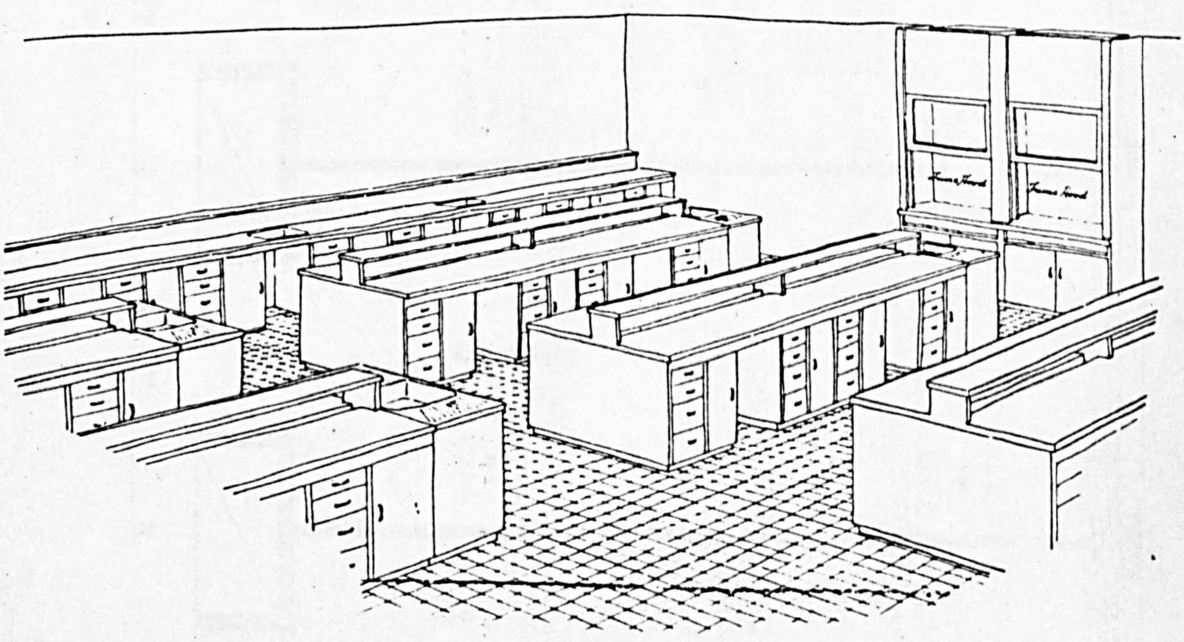
FIGURE 12. Typical working area required for T.V. demonstrations in a lecture theatre (Newcastle). Scale: $\frac{1}{4}$" =1'0"



Source: Robert Matthew, Johnson-Marshall & Partners - work study

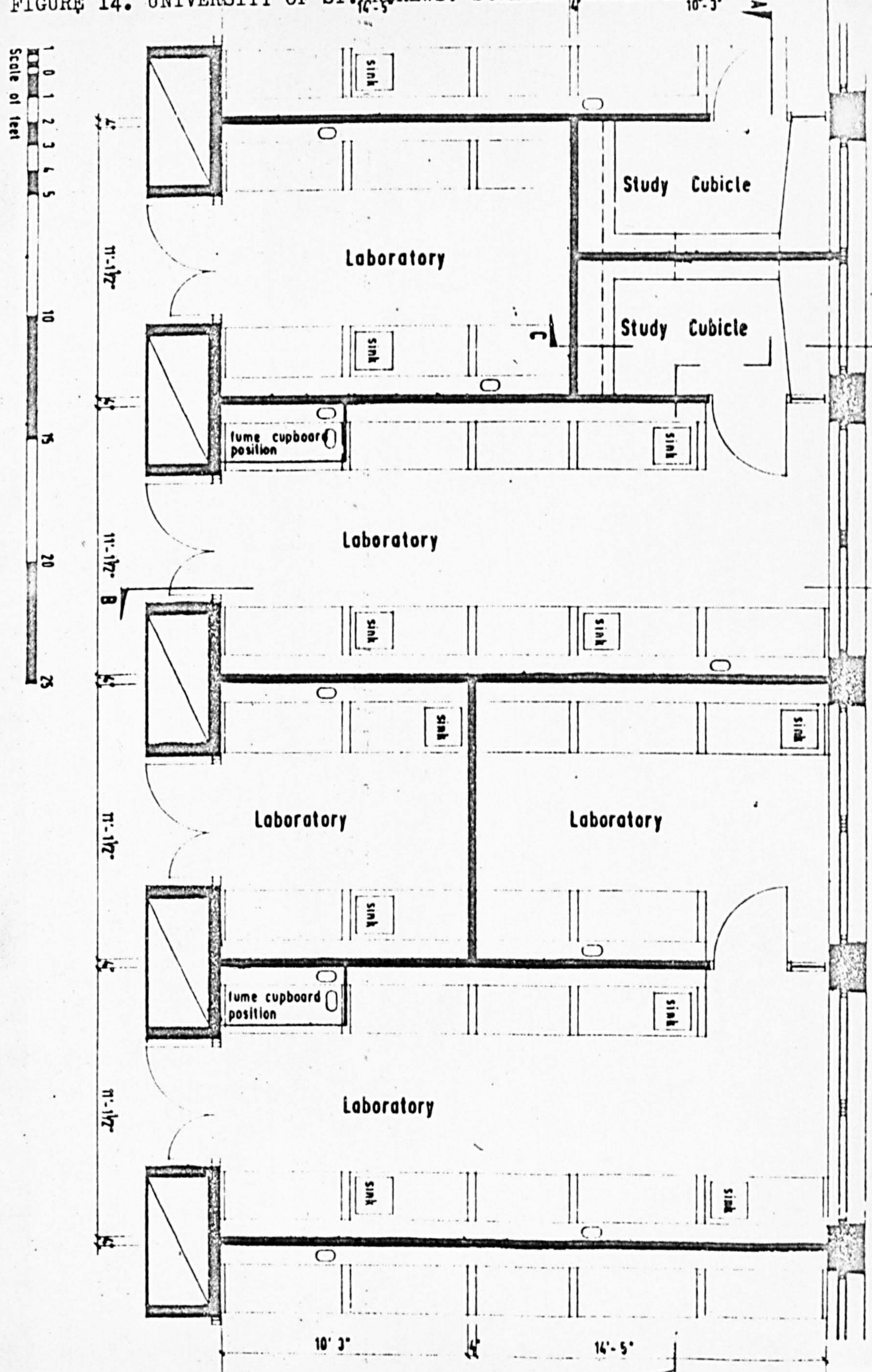
FIGURE 13. Layout for a traditional teaching laboratory suitable for small group or whole class teaching. Scale: 1/16" = 1'0"





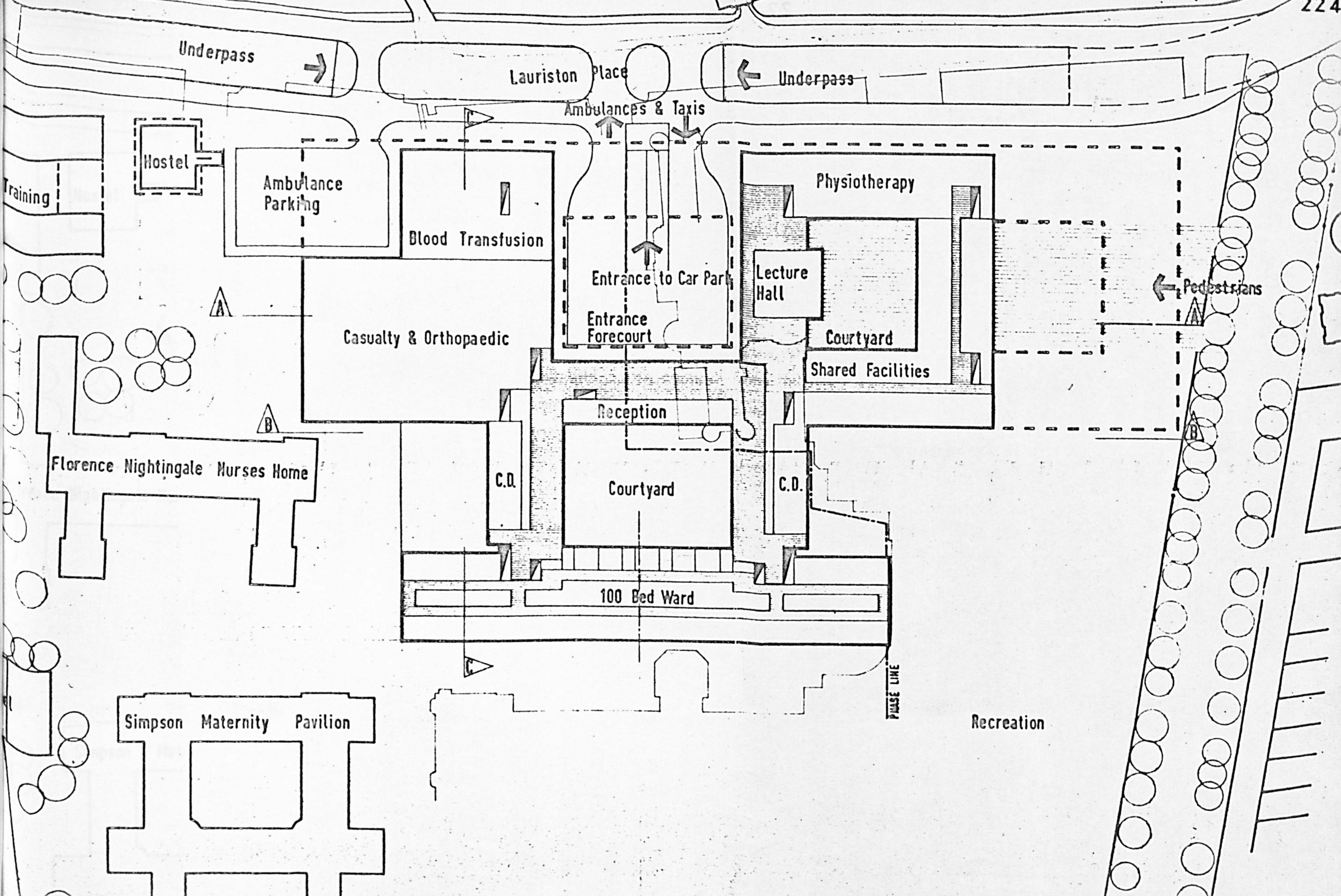
Source: "Medical School Facilities" p.p. 34, U.S. Department of Health, Education, and Welfare.

FIGURE 14. UNIVERSITY OF ST.ANDREWS: Standard Laboratory unit



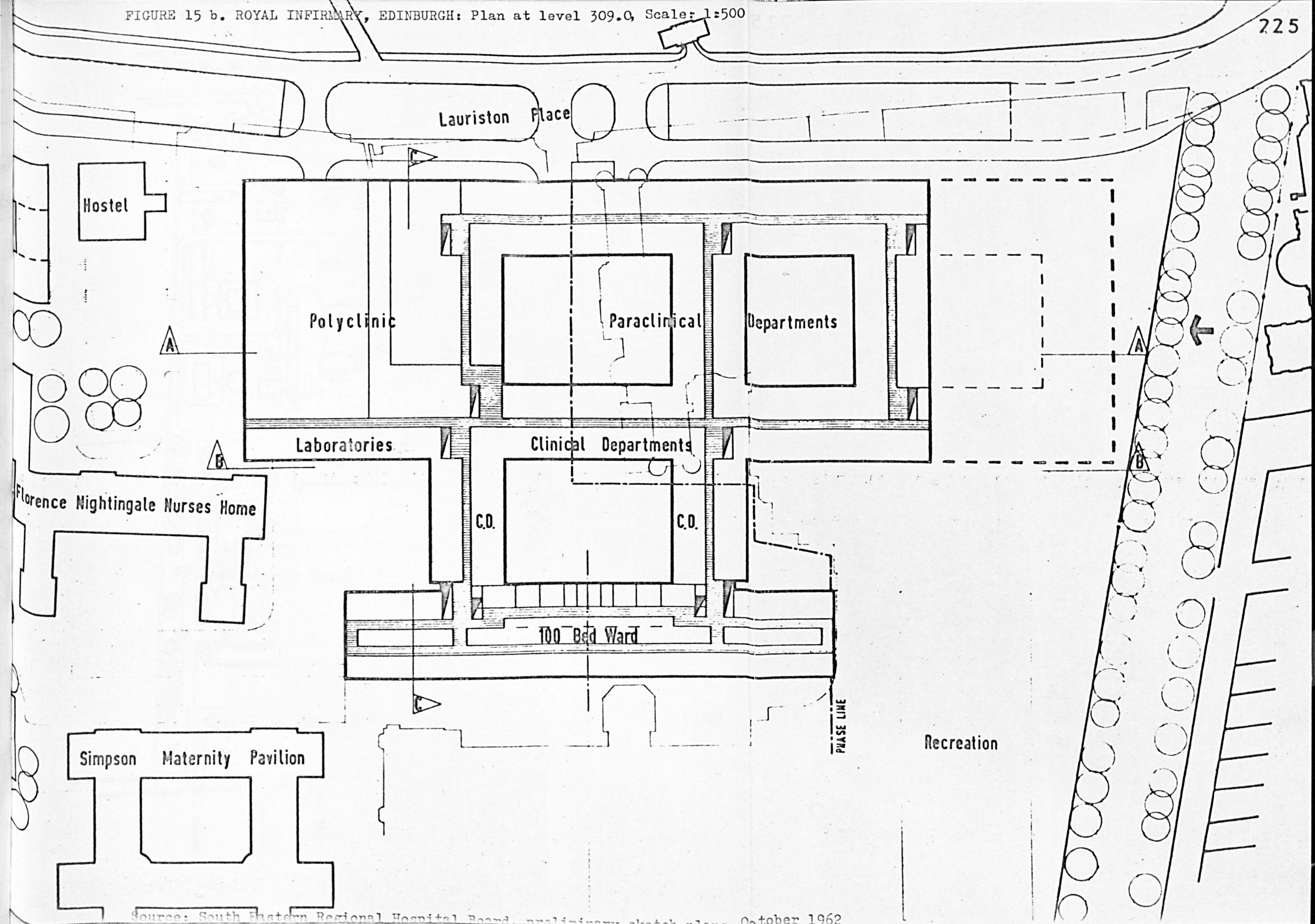
Source: Detailed Design Report, Vol.2, August 1962

FIGURE 15 a. ROYAL INFIRMARY, EDINBURGH: Plan at level 282.0. Scale 1 :500



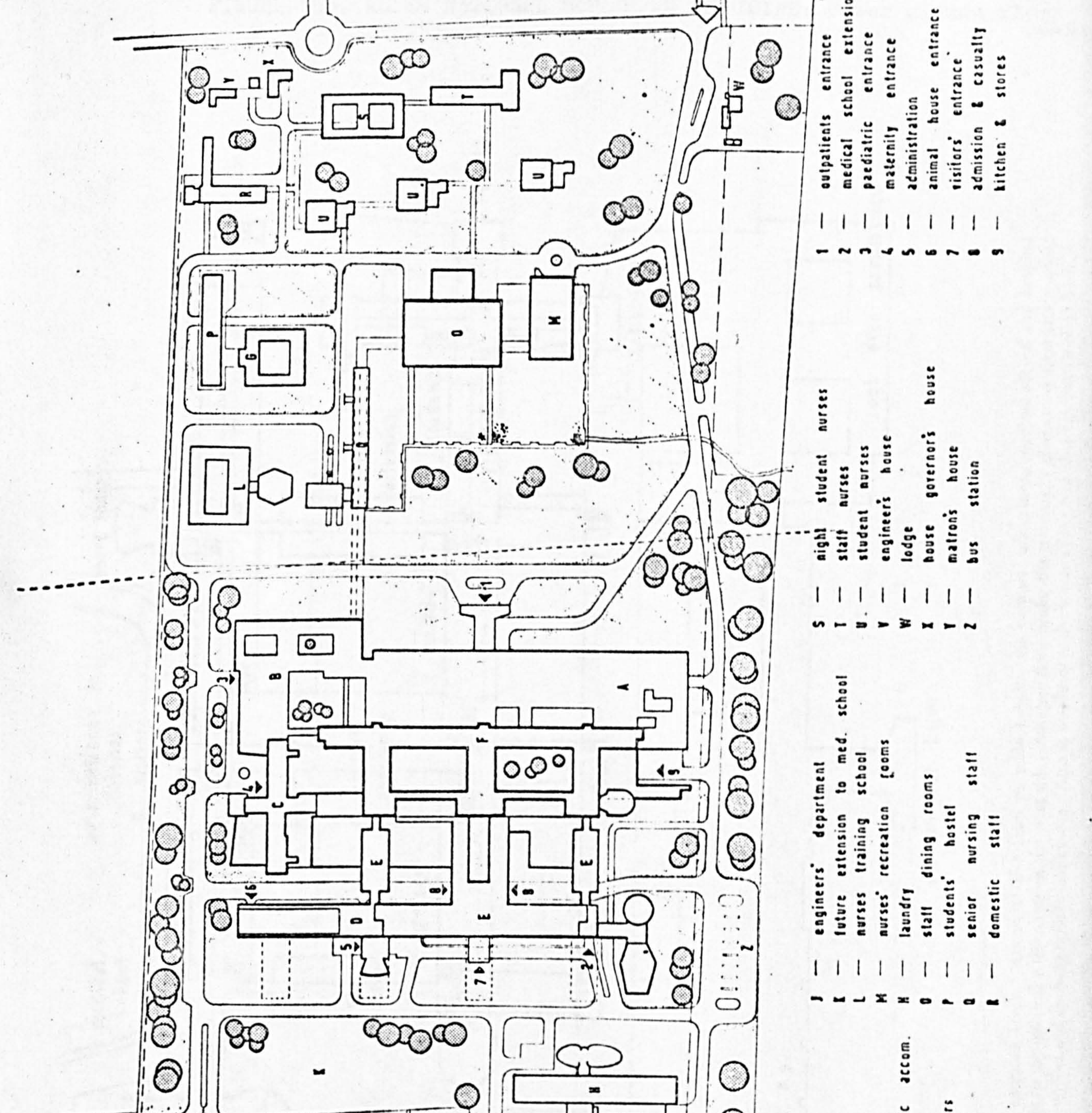
Source: South Eastern Regional Hospital Board, preliminary sketch plans, October [illegible]

FIGURE 15 b. ROYAL INFIRMARY, EDINBURGH: Plan at level 309.0, Scale: 1:500



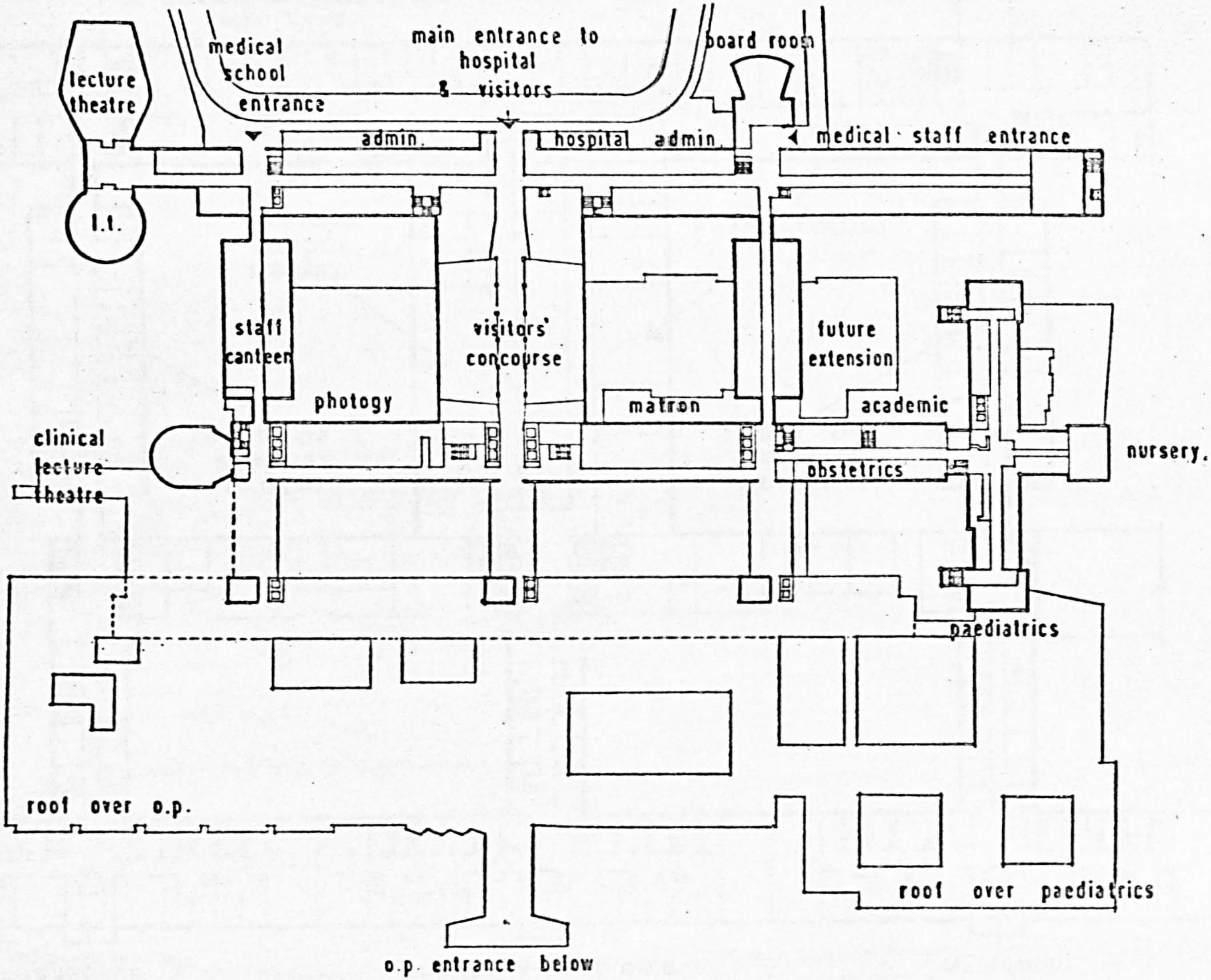
Source: South Eastern Regional Hospital Board, preliminary sketch plans, October 1962

FIGURE 16a. WELSH NATIONAL SCHOOL OF MEDICINE. Block plan.



Source: "Hospital and Medical School Design", G. H. Bell, p.p. 17

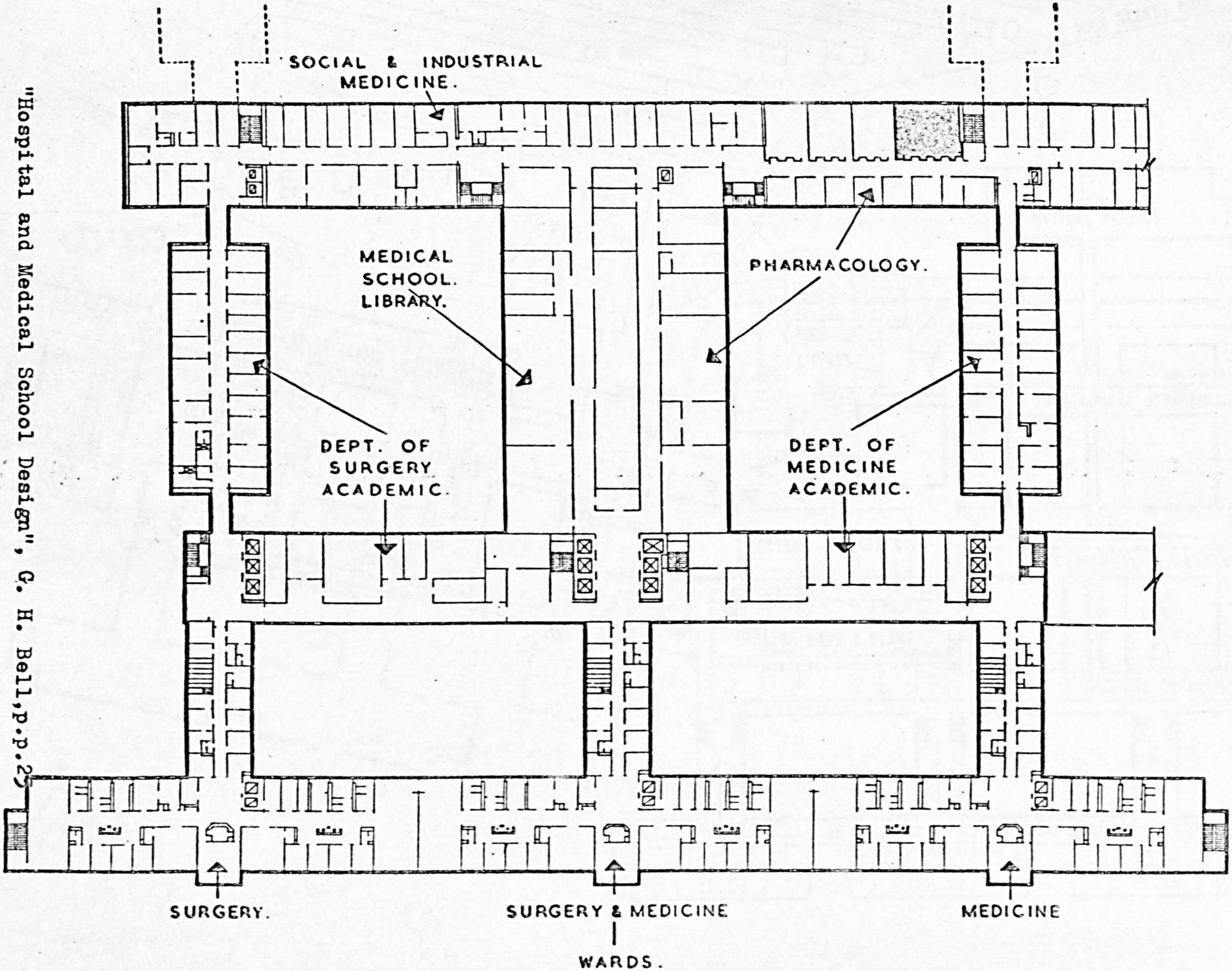
FIGURE 16b. WELSH NATIONAL SCHOOL OF MEDICINE: Upper ground floor plan.



Highest of three entrance levels. Access at this level to main hospital via visitors' concourse, medical school and hospital administration, and to the medical staff rooms on the west side. An open floor under the ward units gives convenient arrangement of engineering services and opening up internal courts. Also at this level is the lower of the two obstetric wards of 31 beds.

Source: "Hospital and Medical School Design", G.H. Bell, p.p. 20

FIGURE 16c. WELSH NATIONAL SCHOOL OF MEDICINE: Second floor plan.



Main medical school floor showing relationship of medical school departments and hospital wards.
(Hatched area indicates joint demonstration area).

"Hospital and Medical School Design", G. H. Bell, p.p.2

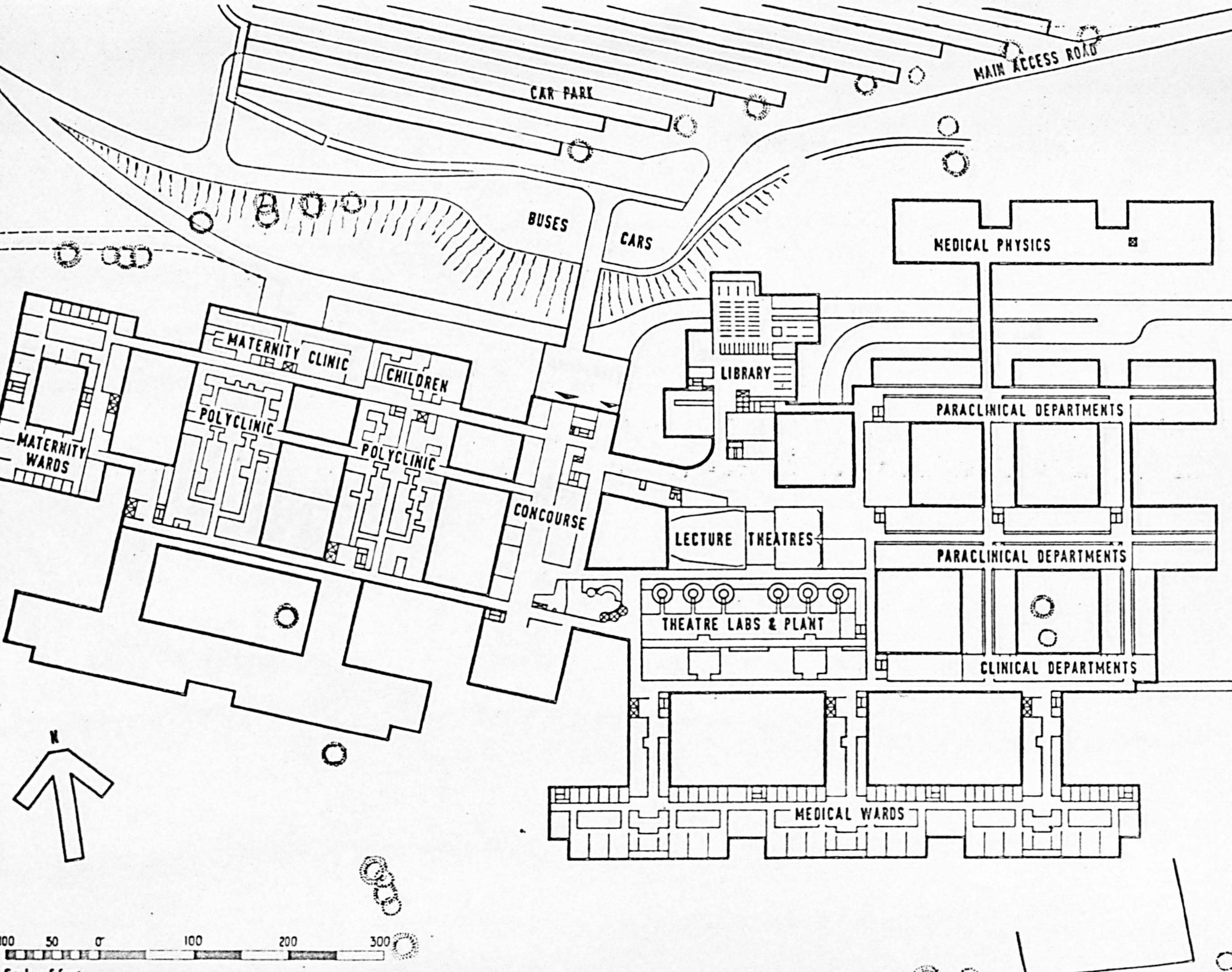
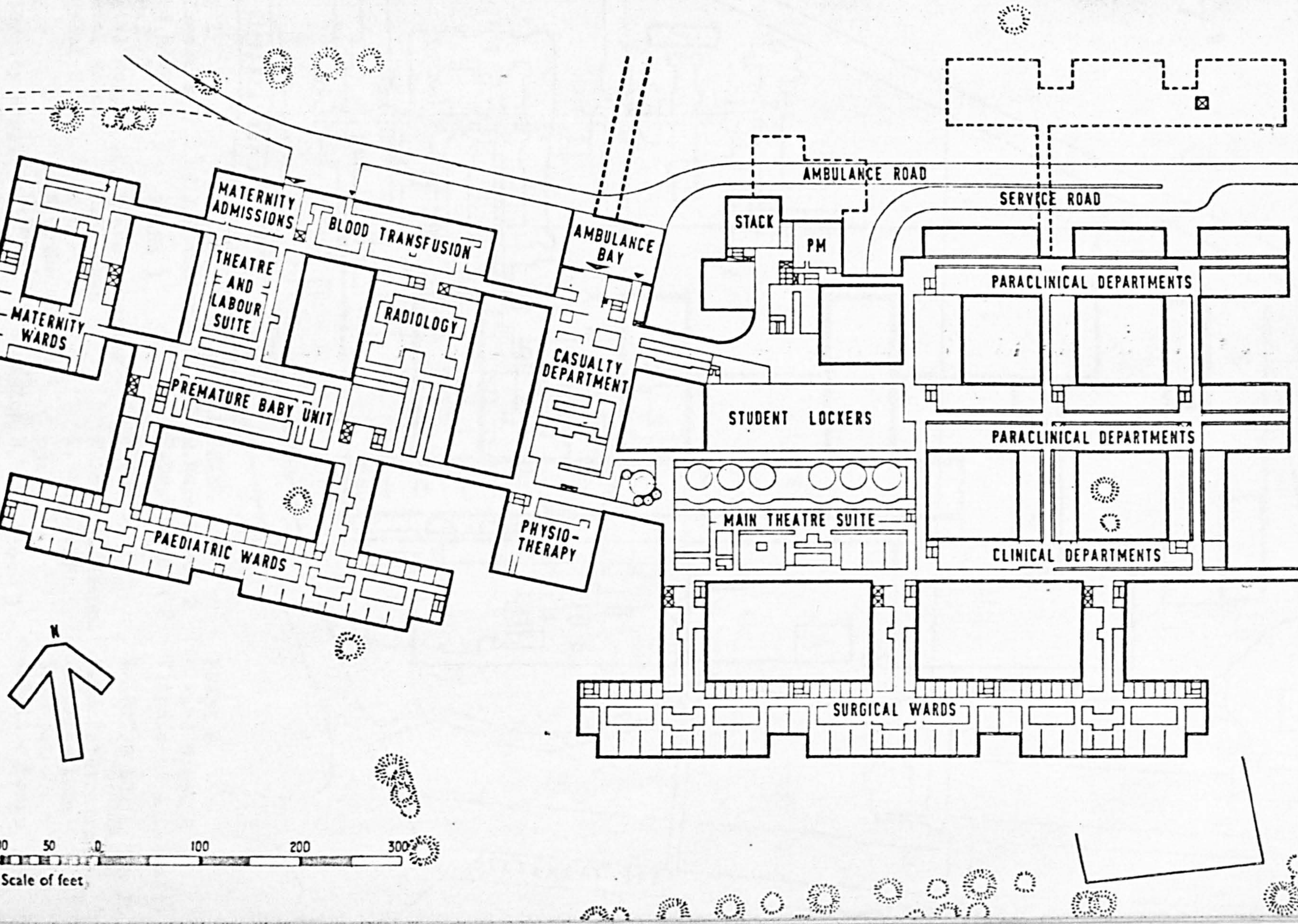


FIGURE 17a. UNIVERSITY OF ST. ANDREWS: Plan at Main Deck level 230

Source: Report on the Preliminary Sketch Plans, May 1961

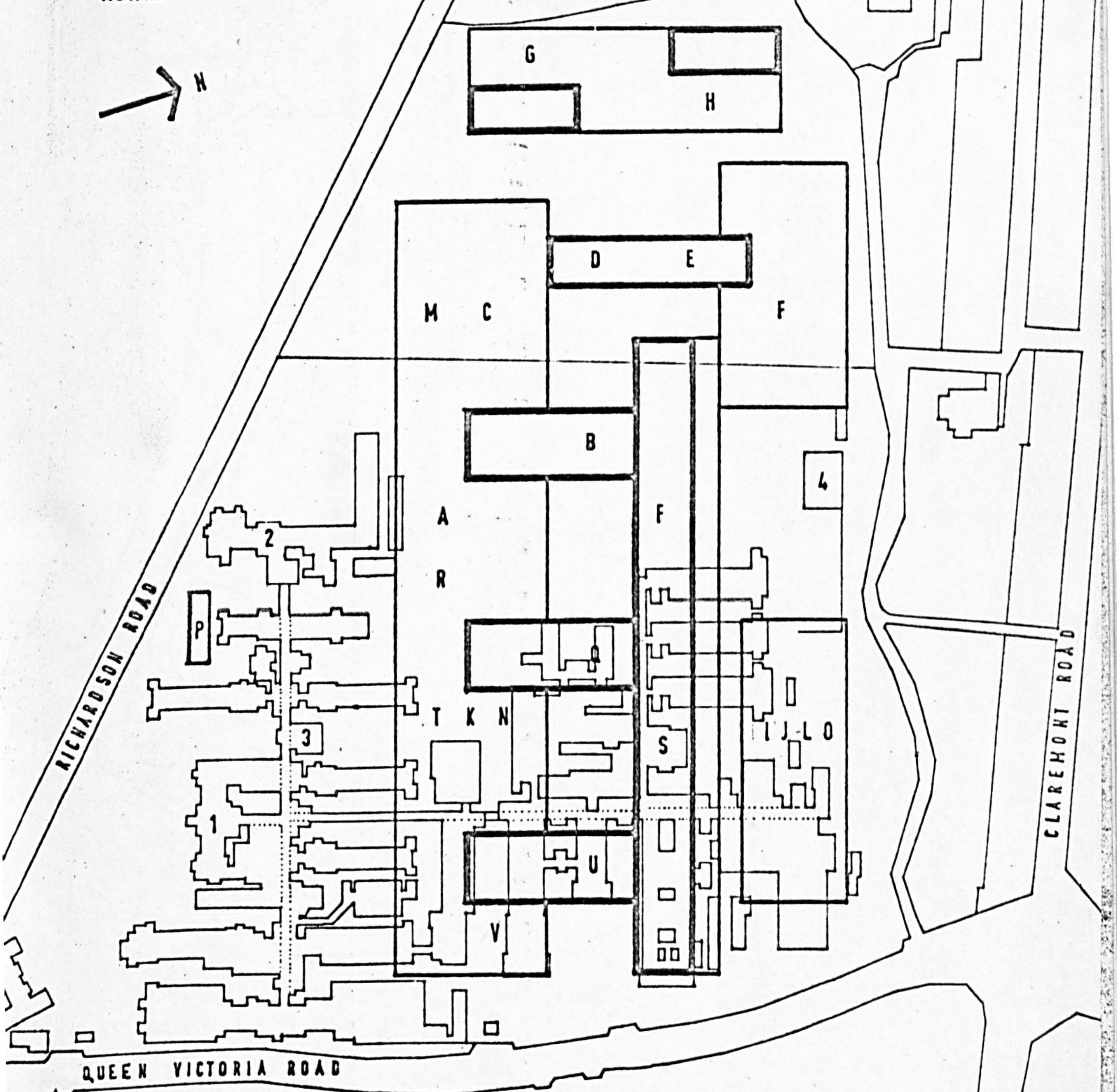
FIGURE 17b. UNIVERSITY OF ST.ANDREWS: Plan at Treatment level 217.5



Source: Report on the Preliminary Sketch Plans, May 1961.

FIGURE 18.

ROYAL VICTORIA INFIRMARY NEWCASTLE UPON TYNE MASTER PLAN



PHASE 1
A. OpTheatres 1
B. Ward Block 1
C. O.P.D. 1
D. Dental Hosp.
E. Dental School
F. Medical School
I. Laundry & Central Stores
J. Pharmacy

PHASE 2
G. Maternity Hosp.
H. Paediatric Hosp.

PHASE 3
K. Radiotherapy
L. Kitchen
M. O.P.D. 2
N. Opthalmic Unit
O. Maintenance St. & Workshop
P. Nurses Teach. Unit

PHASE 4
Q. Ward Block 2
R. Op. Theatres 2

PHASE 5
S. Medical School
T. Radiology

PHASE 6
U. Ward Block 3
V. Accident & Casualty

PHASE 6
U. Ward Block 3
V. Accident & Casualty

EXISTING BUILDINGS TO REMAIN
1. Administration
2. Nurses Home
3. Chapel
4. Boiler House

FIGURE 19a. UNIVERSITY OF SHEFFIELD: Block plan.

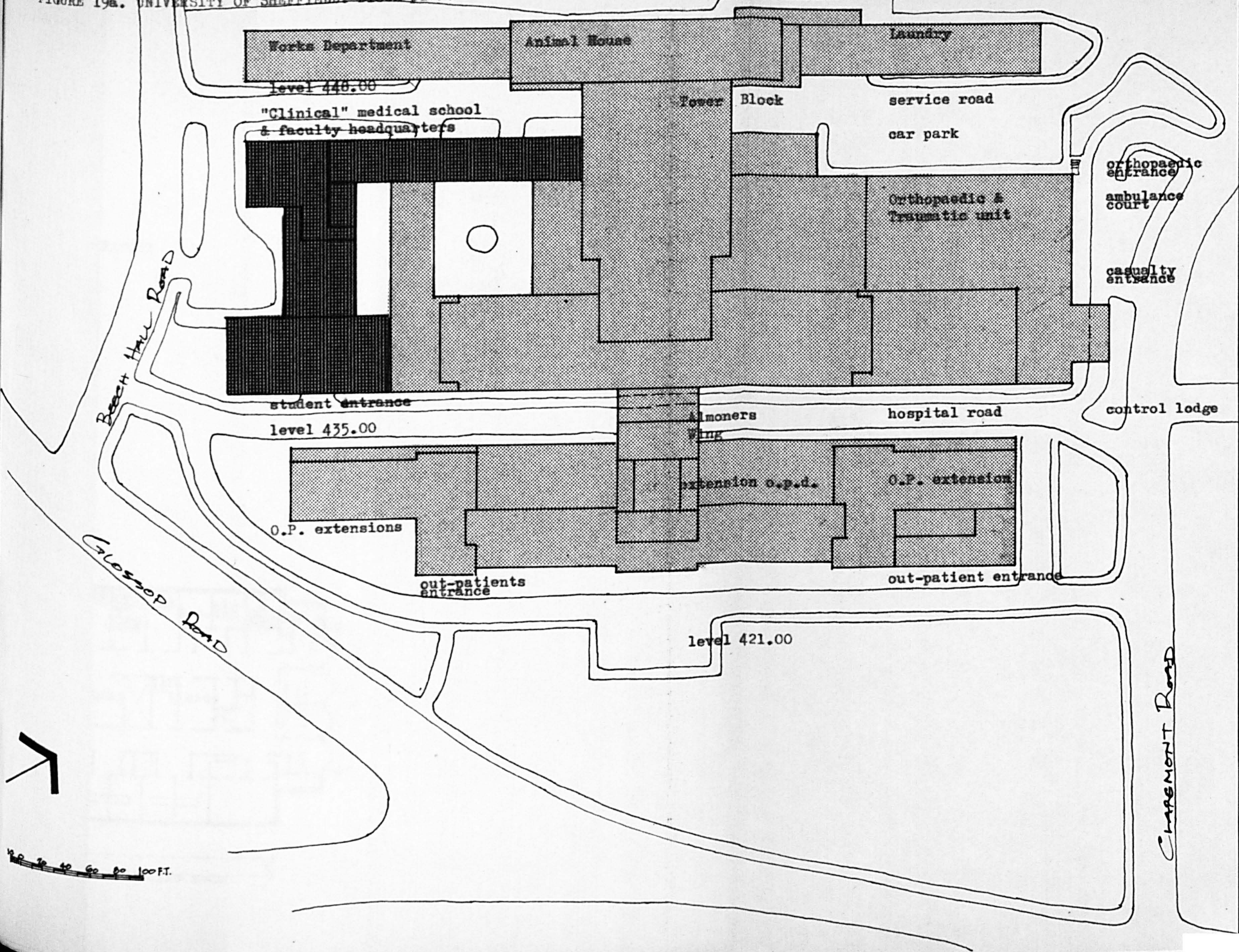
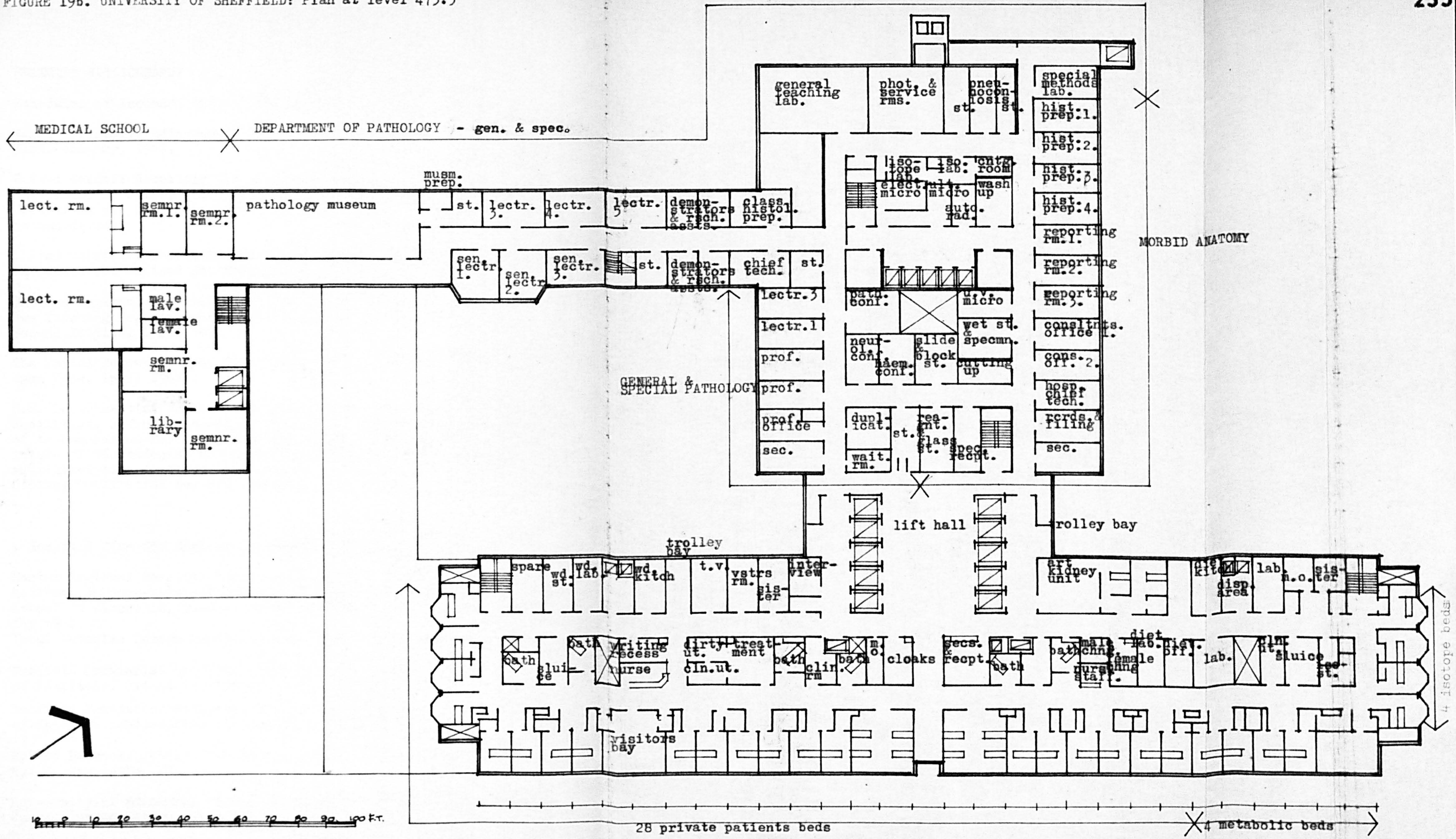


FIGURE 19b. UNIVERSITY OF SHEFFIELD: Plan at level 473.5



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PRACTICAL APPLICATIONS ON MEDICAL SCHOOL DESIGN 4.

The medical schools examined in Chapter 3 are at such a preliminary stage that none as yet has even been built. It is impossible therefore, to make a study of practical applications of new medical school design in this country, although as suggested in previous chapters, it is possible to go some way towards evaluating design procedures and assessing the likely outcome of experiments without recourse to the actual buildings.

Because of this absence of practical "models" in Britain, an alternative has been sought in America where - as suggested in the Dundee Symposium - there have been a number of medical school projects completed in the post-war period. Some of the more prominent of these - but by no means all - will be considered in this chapter. In studying the following American examples, it should be recognised that national conditions, and the implementation of medical education, are not the same in Britain and America; for example, there is no N.H.S. operating in America, also, the average American medical student is already a university graduate when he enters medical school - and consequently he is older than his British counterpart; the American medical course is generally of 4 years (2 years Basic Sciences and 2 years Clinical Sciences). These and other factors however, are not such as to render comparisons invalid, and in this regard, the hypothetical medical school of the U.S. Department of Health, Education, and Welfare, previously analysed, should be useful as a means of relating like and varying aspects of medical schools in the two countries.

A brief description is also given of the planning philosophy and preliminary design of a proposed Preclinical medical school at Salisbury, Southern Rhodesia.

AMERICAN MEDICAL EDUCATION

Historical Survey:

The earliest American doctors were European emigrees, or alternatively, they were self appointed clergy/physicians. Medical education at this time was an extension of English apprenticeship, although American practitioners qualified under the system were not considered the equal of their more adventurous colleagues who had obtained degrees in London, Edinburgh, Leyden or Paris. One such adventurer was William Shippen the younger, who in association with John Morgan and Benjamin Rush, was responsible for founding the first medical college in the U.S. at Philadelphia in 1765. The school was later joined with the Pennsylvania University and is still operating. King's College Medical School (Samuel Bard, Peter Middleton), later known as Columbia University and Harvard Medical School (James Warren, Benjamin Waterhouse), were soom to follow in 1767 and 1783. The English pattern was again largely followed, although it is of some significance that these institutions were closely linked with universities.

It is unfortunate that American medical schools of the following century were unable to maintain fine standards set in what had been a promising beginning in the 1700's. Pressing military needs and a "call of the west", were largely responsible for the establishment of no less than 457 medical colleges run mainly for profit, a system incompatable - as revealed by the English example - with medical education, if the interests of the student are to be paramount.

In 1821, a licensure system was first introduced in the state of Conneticut. It later spread to other states resulting, through the instigation of the New York Medical Society, in the formation of the American Medical Association,1847, aimed at the eradication of unqualified practice, and an elevation of education standards.
An earnest cry for reform began in 1876, and the newly formed Association of American Medical Colleges appealed for a consideration of "....all matters relating to reform in medical college work".(1) At the same time, physicians returning from Europe brought with them the discoveries of Koch and Pasteur, and the scientific ideals of German universities. The Johns Hopkins medical school was one recipient of this inspiration and became an outstanding contributor to medical science at the end of the 19th and in the 20th centuries. (see Fig. 20b.)

In 1907, the Council on Medical Education of the American Medical Association (formed in 1904) undertook a survey of American medical schools. A storm of disapproval at its subsequent findings, led to the appointment of Abraham Flexner by the Carnegie Foundation for the Advancement of Teaching. Flexner was given the onerous task of finding out just what was wrong with American medical education.
His scathing report in 1910 criticized the whole educational system and emphasized the deplorable lack of governmental control; the report was all the more humiliating to the medical profession in view of the fact that Flexner was a layman. He had aroused nationwide interest which effectively brought about large scale closures of proprietory schools; so much so, that by 1915 the number of medical schools in America was reduced to 66 compared with a total of 160 in 1900.

1. Young R. H. Journal of Medical Education, August 1959, Vol. 34, p.p. 802.

FIGURE 20a: Pennsylvania Hospital 1799. Source: Autobiography of Benjamin Rush; Edit. G. W. Corner, Princeton Univ. Press; American Philos. Soc. 1948, p.p. 117

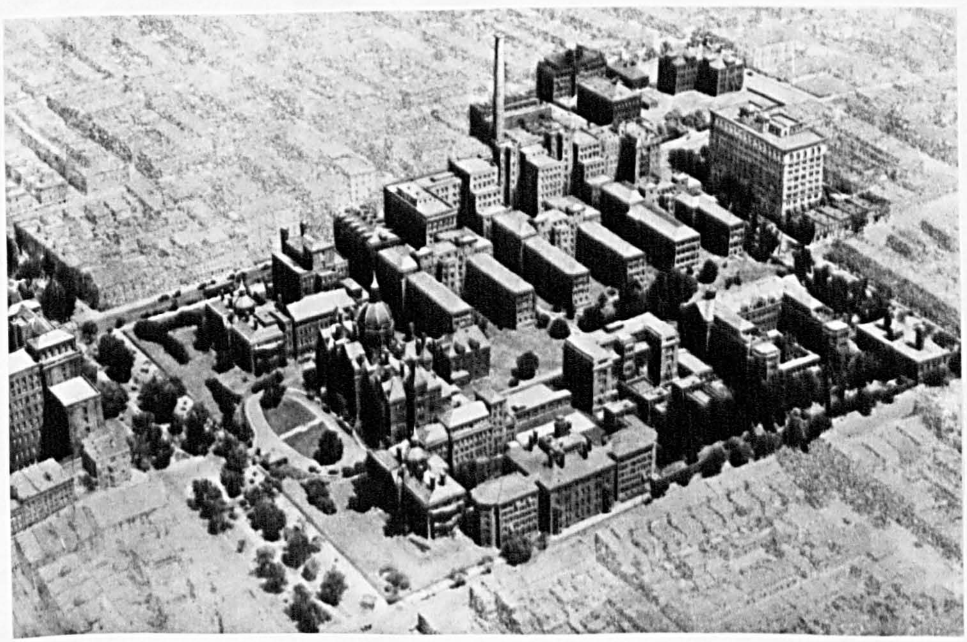

FIGURE 20b: Johns Hopkins Medical Centre, c. 1895 - the medical school is in the top right hand corner. Source: J. C. French; A History of the University founded by Johns Hopkins. Baltimore; Johns Hopkins Press, 1946, p.p.417.

By 1920 many of the earlier inadequacies had been righted. Science exerted a more profound influence on medical education, problems of finance were reduced by grants from the Rockefeller and Carnegie Foundations, and the influence of Welch, Osler, and the Hopkins school was being widely felt. The results were beneficial to the whole country and brought world recognition of the new rise in American medical education standards.

The period between the two Wars witnessed growing uneasiness with set examinations as the sole arbiter, by leading educators who also came to recognize a danger in the need for students to specialize at too early an age.

The Yale Plan:

Dr. George E. Blumer, previously educated at Johns Hopkins, had begun to agitate for a reform of the medical curriculum during his term of office at Yale. Milton C. Winternitz - another product of the Hopkins School - came to office in 1917, and extended Blumer's work by formulating a new medical school curriculum which dispensed with regular examinations; it was designed to encourage individual iniative by allowing large "free time" allotments in the syllabus, whereby students were free to pursue special interests, and to further privately the substance of literature discussed during formal lectures. In 1925, Yale made it a requirement that each student should present a dissertation based on the findings of original research as a major prerequisite for graduation, complementary to examinations set by the National Board of Medical Examiners.

As might be expected of such a radical departure from the conventional, Winternitz' plan met with considerable opposition, and is still criticized by many. However after 40 years, it continues to win support.

By 1939, the American medical curriculum had become no less heavily encumbered than that in Great Britain and a similar problem arose in the inability of students to encompass the wide accumulation of medical technologies. The War, new medical discoveries (many of which unfortunately, only seem possible in time of national emergency), and other distractions, directed the attention of medical educators towards more pressing problems. Following the cessation of hostilities they turned afresh to medical education, and some of them, to view pre-war medical education in a different light - especially the medical curriculum. The Goodenough Report had also been published in Great Britain.

A Liaison Committee on Medical Education was set up in 1942. The Committee represents the Association of American Medical Colleges, the Council of Medical Education and Hospitals of the American Medical Association, and it carries out periodical surveys of medical schools, including new schools,which are inspected annually for four years after their inauguration. It is to the credit of the Liaison Committee, that since its inception no attempt has been made to standardize the operations of medical schools. The Committee's periodical school surveys are voluntary and intended for the purpose of encouraging individuality and experimention rather than for any desire to inhibit.

As a challenge to the future, and with the encouragement of the Liaison Committee, there have in the post-war period been some interesting experiments on medical education by individual American schools. Few of these have been operating long enough to make a comprehensive assessment of American medical education and medical schools. Individually, however, most have benefited by their enterprise and their desire to be done with that which is stereotyped and an unnecessary encumbrance on the medical student. Lessons learnt in these experimental stages are benefiting other American schools, and also medical schools in this country.

WESTERN RESERVE SCHOOL OF MEDICINE, CLEVELAND, OHIO

At Western Reserve University,in 1945, a rare situation arose which would probably be the envy of medical education reformists in any part of the world. The medical school found itself in the possession of a medical faculty, the majority of which was young, unfettered by tradition, and enthusiastic for educational reform.

Recognizing that the medical curriculum had become heavily overloaded and stereotyped, Joseph T. Wearn and John L. Caughey instigated an examination of the whole programme. Results of this investigation prompted the Faculty of Full Professors to appoint Dean T. J. Wearn,in 1946, to the leadership of a "General Faculty" whose duty it was to examine student affairs, instruction, and interdepartmental cooperation. The General Faculty was to be comprised of assistant professors or higher (approximately 300 persons), and also to include the directors of the 12 medical school departments; the directors appointed two additional departmental members of rank less than assistant professor. After 4 years of intensive research, they came to some important conclusions:

1. Total coverage of a medical curriculum was impossible by either staff or students. As an alternative, it was proposed to try and establish a basic fund of knowledge upon which the student's powers of skill and competance could be developed.

2. There had arisen too great a division between Preclinical and Clinical teaching and it was highly desirable that an improved integration of the two should be effected.

3. The status of the undergraduate student should be raised to one comparable with a postgraduate student.[1]

4. Medical education is itself in need of research and constant revision to meet rapid changes in science, economics, and the social structure. In this respect, the curriculum should be flexible and open to regular adjustment after critical appraisal.

Based on these conclusions, a revised medical course was planned and inaugurated in 1952 following two years of programming by a Standing Committee on Medical Education of the General Faculty. The responsibilities of the Committee were generally defined as follows:

- The selection and definition of objectives of medical education.
- The evaluation of current programmes.
- To develop and recommend changes in programmes of medical education necessary to meet future needs.
- The examination of subjects which overlap with other departments, and phases of subjects which can best be taught in cooperation with other departments.
- To examine the objectives of medical education.[2]

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1. Most American medical schools require a minimum of four years college training before the student is allowed to enter medical school; in some cases this has now been reduced to 3 (or 2) years. The average age of students entering American medical schools is between 21 and 22 years; in Great Britain it is about 18 years.

2. Journal of Medical Education; Ham T. H. December 1959, Vol. 34, p.p. 1164

CONSEQUENCES OF THE NEW CURRICULUM AT WESTERN RESERVE

The 3 Phase Programme (Figure 21a.):

The traditional curriculum at Western Reserve had been one of a two year Preclinical introduction to two years of mainly Clinical apprenticeship. As had already been appreciated by Goodenough, the Committee felt that in the majority of student cases, the disruption occasioned by a sudden transference from one programme to another created problems of readjustment for the student and helped to bring about an improper attitude to Preclinical studies - that of an academic hurdle. The intention was, of course, that the Preclinical and Clinical years should be complementary, both providing the student with an insight into science as an effective instrument in the treatment and care of patients.

The intention had been the right one, but the Committee felt that its application had been wrong. It thus devised a new programme based on a 3 phase development over 4 years (see Figure 21a).

Medical School Organisation (Fig. 21b):

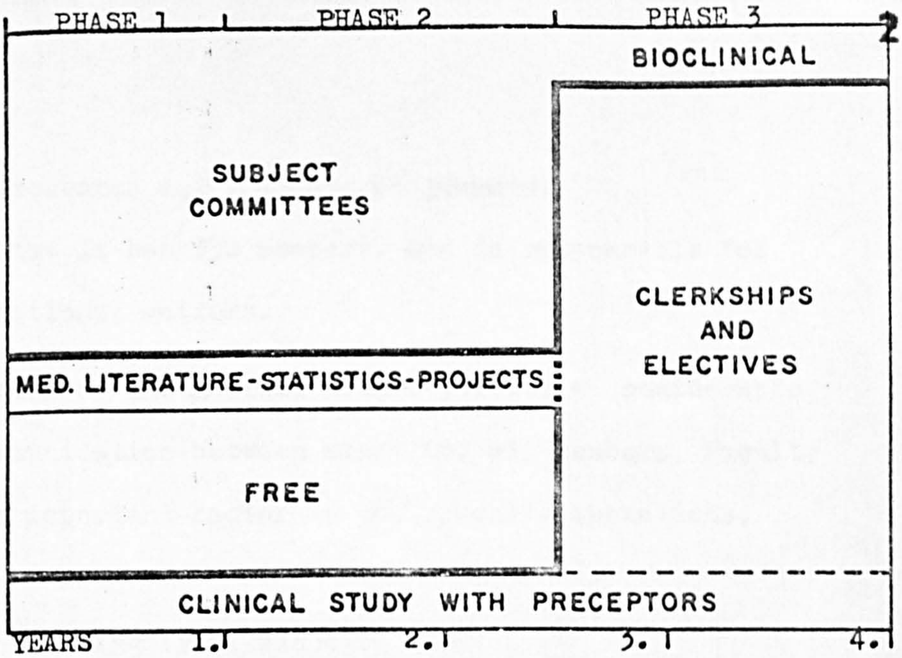
The responsibilities of the three main branches of school government were clearly defined. These branches are now as follows:

1. Administration (of day to day activities): It operates through phase coordinators and assistant deans, and through the associate dean for student affairs.

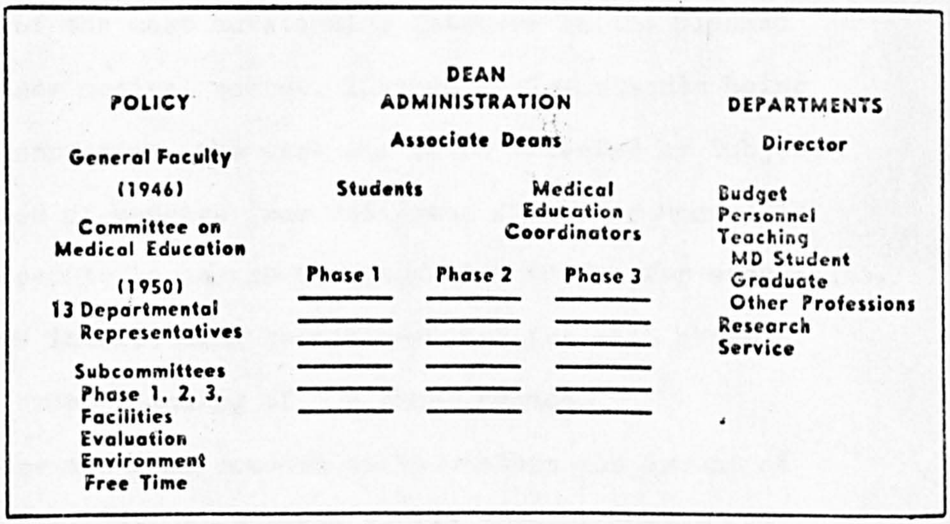
2. Departments: Although the system differs from most schools, the departments have still retained much of their autonomy on faculty

FIGURE 21. WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE

a. 3 Phase Curriculum



b. Organisation of the School of Medicine



THE ORGANIZATION OF THE SCHOOL OF MEDICINE. As indicated in diagram, the thirteen departments of the School of Medicine are responsible for all faculty personnel and are represented on the Committee of Medical Education which is responsible to recommend policy to the general faculty concerning curriculum. The program of education, when approved is carried out by subject committees in Phases 1, 2 and 3. Each subject committee is directed by a chairman and is composed of members of different departments as agreed to by the directors of the departments. The associate dean of medical education provides administrative leadership and certain centralized services such as management of the laboratories, stock rooms and production of syllabus material. The Coordinators of Phases 1, 2 and 3 serve as leaders for the chairmen of subject committees of their respective phases and of an executive committee composed of the directors of departments that are most concerned with the particular teaching program. This organization is in itself experimental.

c. A typical Subject Committee (Phase 1)

	Anatomy	Biochem.	Physiol.	Others
Cell Biology	1	3	1	3
Tissue Biology and Neuro-Muscular	4	1	2	2
Cardiovascular and Respiratory	2	1	2	1
Metabolism	2	2	3	1
Endocrines	2	1	4	1

The distribution of faculty effort may be arranged vertically by departments or horizontally by subject areas. Numbers indicate the number of representatives from each department on a given subject committee.

Source: Journal of Medical Education, Vol.31, Aug. '56, No.8

matters, budgets, research and graduate programmes.

3. General Faculty: It has 350 members, and is responsible for the policy on educational matters.

The organization of the medical school permits a considerable amount of intercommunication between staff and all members. Faculty re-appraisal is an important factor in the school's operations.

Subject Committee Teaching (Fig. 21c):

This was one of the most outstanding features in the planned operations of the new medical course. Instead of departments being responsible for instruction, the work was to be directed by Subject Committees comprised of members from different faculties who would be required to cooperate to ensure an integrated course for each phase. There are now three interlocking committees (one for each phase) which control the broad planning of the three phases.

Initially there was some concern as to whether the amount of time spent in Committee teaching would be too time-consuming for faculty members, however, after the initial planning had been completed, it was found that staff spent little more time than they did under the old course.

The Clinics:

There have been a number of innovations in the Western Reserve medical course; one of the more controversial of these is the "Clinic" method of providing the medical student with practical experience. There are three types - Family, Continuity and Group Clinics.

Family Clinic: Early in the first year, the student is introduced to the living patient - a woman in pregnancy. He is expected to follow the patient (and family) through the various stages of pregnancy, childbirth, and early infancy, in Phases 1 and 2, and if he so wishes, in Phase 3. Students in groups are guided by a clinical preceptor, and paediatric and obstetrical staff. There is disagreement in the faculty as to the effectiveness of Family Clinic teaching, the main criticism being that it is instrumental in developing "attitudes rather than the acquisition of factual knowledge"[1]. The criticism has come mostly from faculty members "whose orientation is primarily toward the biological sciences or clinical investigation"[2].

Continuity Clinic: It is made up of a series of clerkships of one-half day each week in Phase 3 (16 months).The clerkships are comprised of - a 4 months introductory or basic clerkship, then clerkships of two months in surgery, obstetrics & gynaecology, surgical specialties, and an elective clerkship (mostly in paediatrics). There is also a 2 months clerkship in a group clinic, on ambulatory medicine (4th year students).

The Family, Continuity, and Group Clinics are a positive endeavour to provide continuous practical training throughout the 4 years of the medical course.

1.& 2. Lee P. V. Medical Schools and the Changing Times. Reprint from the Journal of Medical Education, December 1961, Vol. 36, p.p. 112.

Elective time and Student Research:

One of the primary reasons for the initial departure from the traditional curriculum,was that the General Faculty considered it to be of the "spoon-feeding" type which provided for too little student initiative.

As an encouragement to self-education in the new curriculum, students are given 1½ days free time per week in Phases 1 and 2, and two or more months in Phase 3. Initially, the amount of elective time in Phase 3 was 6 months, but this has since been modified following the introduction of assigned clerkships in general surgery and the surgical specialties.

Students in Phases 1 and 2 are required to undertake an independent research project. It has been found that research work and free time work well in conjunction with one another. All of this research work (plus all other laboratory activities) is carried out in multidiscipline teaching laboratories.

Evaluation:

The need to assess the possible consequences of a radical departure from the traditional curriculum was forseen in the preliminary planning stages. Evaluation studies began with the introduction of the first student year to the new course. These are by no means complete, but some of the preliminary information gained so far suggests that:(1) students themselves perceive of their teachers as being more interested in helping them than do students in other medical schools; (2) they still retain their academic drive, but they are now more interested in self-education without undue recourse to competition or other anxieties which are often apparent in other medical students.

Evaluation studies have as yet given no positive indications of student attitudes towards patients and medicine generally, although, the faculty at Western Reserve is firmly of the opinion that students will "have much healthier attitudes toward their patients than was formerly the case".(1)

Despite the considerable emphasis on the teaching function of the medical school, there does not appear to have been any diminution in the attitude to research, nor its productivity, as evidenced by more recent staff achievements.

One of the most encouraging results of the Western Reserve experiment has been the enthusiasm shown by both staff and students.

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1. Lee P. V. Medical Schools and the Changing Times. Chapt. 3,p.p.107.

AN ARCHITECTURAL INTERPRETATION OF THE NEW CURRICULUM REQUIREMENTS AT WESTERN RESERVE

Multidiscipline Laboratories:

They are one of the most significant architectural features of the Western Reserve medical school, and represent a good example of the architectural embodyment of a theoretical concept. The initial requirement was to provide an environment which would facilitate interdepartmental teaching, and at the same time, encourage self education by students. The school's approach to the requirement was to plan and design a student laboratory "home" in which individual study, research,and other laboratory activities could all take place.

The principle of the multidiscipline laboratory has since been adopted by a number of other American medical schools (although adapted to individual needs). A fuller account of the Western Reserve teaching laboratories will be given here as it may be of use to other medical schools contemplating their use.

Laboratory Operation:

At the beginning of the year, the incoming student selects a partner and is allotted a random place in the laboratory; each student is assigned to a study desk solely for his own use, and to a work desk which he shares with his partner. Students retain their positions in the laboratory with unlimited access (24 hour basis) for the whole of the academic year.

Laboratory exercises are prescribed by the Subject Committees who also provide instruction on the subject. The normal procedure is for a Subject Committee representative from the department whose experiments are to be performed, to carry out a pilot exercise using equipment and reagents identical to those to be used by the students.

A Laboratory Manager is responsible for laboratory operations, including maintenance of equipment and stocks, and for preparing the laboratory for particular exercises. Prior to an exercise, he obtains a syllabus from the Subject Committee and prepares the equipment and reagents for their preliminary experiment; he also assesses the necessary supplies for medical students. Based on the syllabus, the Laboratory Manager prepares a work order which is directed to a Stockman.

The Stockman in turn issues supplies and additional equipment. He places calorimeters, water-baths, centrifuges or other communal equipment on an accessory table, and immediately at the completion of the exercise the equipment is cleaned for re-use or storage. For microbiology, materials are obtained from the media room of the Department of Microbiology; afterwards, contaminated glassware and media etc. are returned to be sterilized. Histology, pathology, haematology, and neuro-anatomy, maintain separate slide collections which are distributed and collected as required. Gross specimens for anatomy and pathology are the responsibility of the individual departments.

Multidiscipline laboratories are provided for -

1st year students: Phase 1 Laboratories on the 5th floor of the medical school (see Figs. 22, 23, & 24).

2nd year students: Phase 2A Laboratories in the basement of the medical school. The 140' x 22' teaching laboratory,accommodating 80 students, is a dual purpose area capable of whole class or small group teaching. It may be subdivided into 10 smaller units by folding plastic doors (see Fig. 25a).

3rd year (first half) students: Phase 2B Laboratories on the 1st floor of the Institute of Pathology (see Fig. 25b).

Phase 1 Laboratories:

These have served as a model for the multidiscipline module; they accommodate 104 students in 5 rooms of sixteen students (each) and two rooms of twelve students (each). Dr. Edra Spilman considers the 16 student laboratory to be the ideal size on the grounds that one instructor can serve a 16 student laboratory as efficiently as a 12 student laboratory; he also feels that it would be possible to provide efficient teaching for a student group of up to 20 students under the one instructor: "With proper management, any size unit can be made to operate efficiently (for example, our Phase 2A laboratory which seats 80 students)"(1).

Each 16 student laboratory unit is 32' x 22', providing 44 sq.ft. per student, which includes the area taken up by benches and equipment. Dr. Spilman considers this size to be inadequate, and that it should be increased by "one-half, or, better doubled"(2).

Supplementary accommodation used in conjunction with the multidiscipline laboratories is as follows:

A Dispensing Stockroom 55' x 11', which is located centrally for all laboratories on the 5th floor. It is used for general storage and for making solutions.

1.& Spilman E. The Management of Multi-discipline Laboratories, p.p.12.
2. Phamplet of the Western Reserve School of Medicine, 25th March, 1963, p.p. 12 & 13.

A Closed Stockroom of 225 sq.ft. which Dr. Spilman does not consider enough.

A Walk in Cold Room, 11' x 8', for storing infant cadavers and for general purpose refrigeration.(1)

An indenendent animal room of 28' x 11' is reserved for student use. It contains metabolism cages for rats and dogs, and cages for the general care of small animals - rats, guinea pigs, mice, and chickens.

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1. Based on the number of students at Western Reserve, Dr. Spilman assesses that a good working ratio of storage area/laboratory space should be between 33% and 50%. Management of Multid. Labs, p.p. 13.

   Architects: Garfield, Harris, Robinson and Schafer; Cleveland.

   Detailed planning was undertaken by a sub-committee under the chairmanship of Dr. L. O. Krampitz.

   Designs for laboratory layout and furniture by Leon Gordon Miller; Cleveland.

   Laboratory benches by the Variety Cabinet Co., Toledo, Ohio.

WESTERN RESERVE CRITIQUE:

Cons:

- There is disagreement on the effectiveness of the Family Clinic system of Clinical training. The main criticizm is that it creates attitudes rather than provides facts.
- Initially there was no clerkship in surgery and the surgical specialties. This has now been rectified.
- Dr. Spilman does not consider that teaching laboratory units for 16 students are large enough at 32' x 22'. They could be increased by 1.5 to 2 their present size.
- Cold Room storage is inadequate.

Pros

- All student exercises are contained in a single laboratory area, making for ease of teaching and supervision.
- The student is provided with a "home" which is available at all times. It elevates his status more to that of a postgraduate student and gives him a sense of "belonging". (Journal of Medical Education, Spilman E., Nov. 1958, p.p. 168)
- Laboratory operations are centralized and coordinated. One of the drudgeries - the preparation of demonstrations - usually facing departmental staff is removed, and carried out by a minimum of staff who are specifically trained and employed for this purpose.
- The laboratories are fully occupied throughout the year, as compared with the partial and inefficient use of most traditional teaching laboratories.

FIGURE 22. WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE: 5th floor plan - Phase 1 teaching laboratories (multidiscipline).

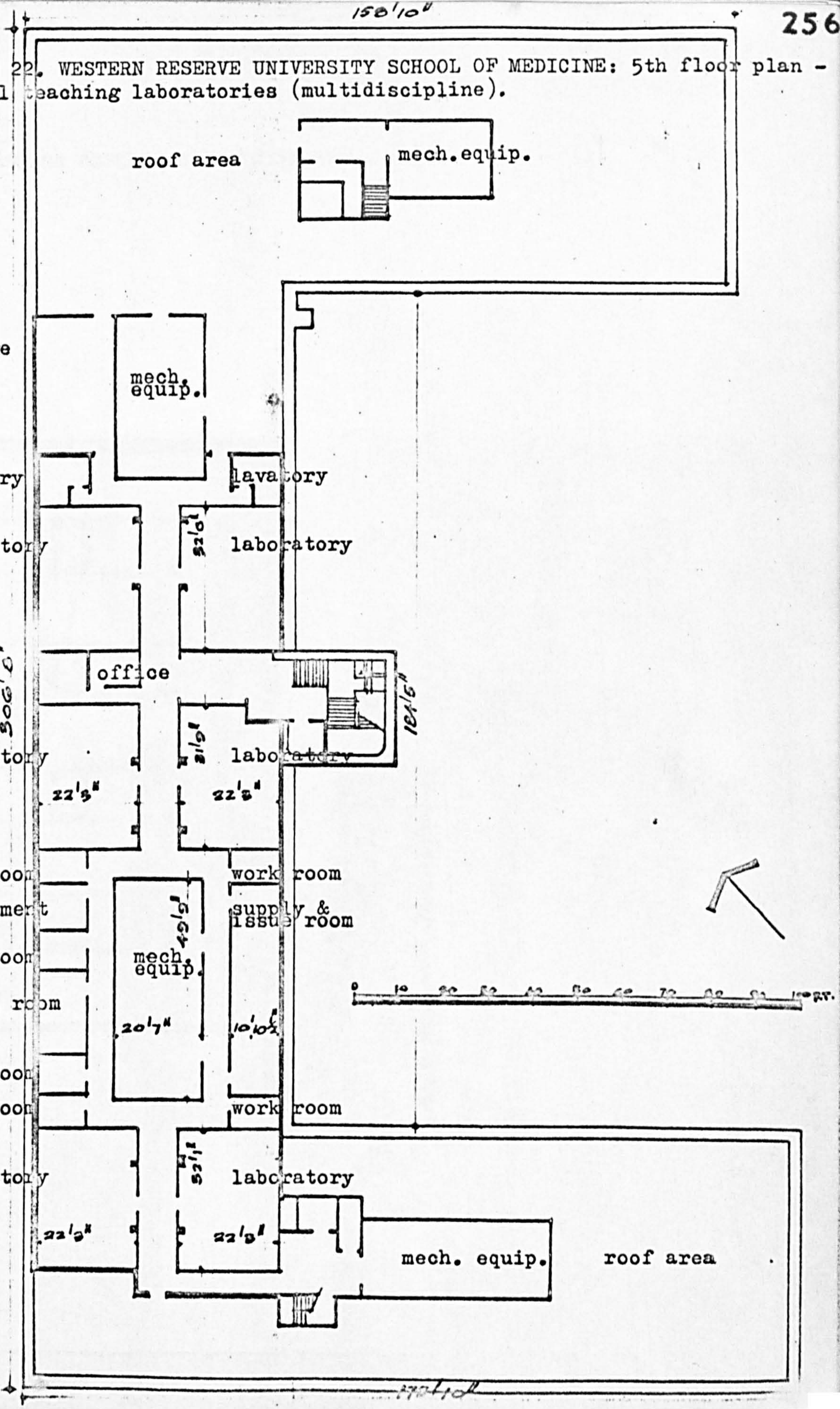
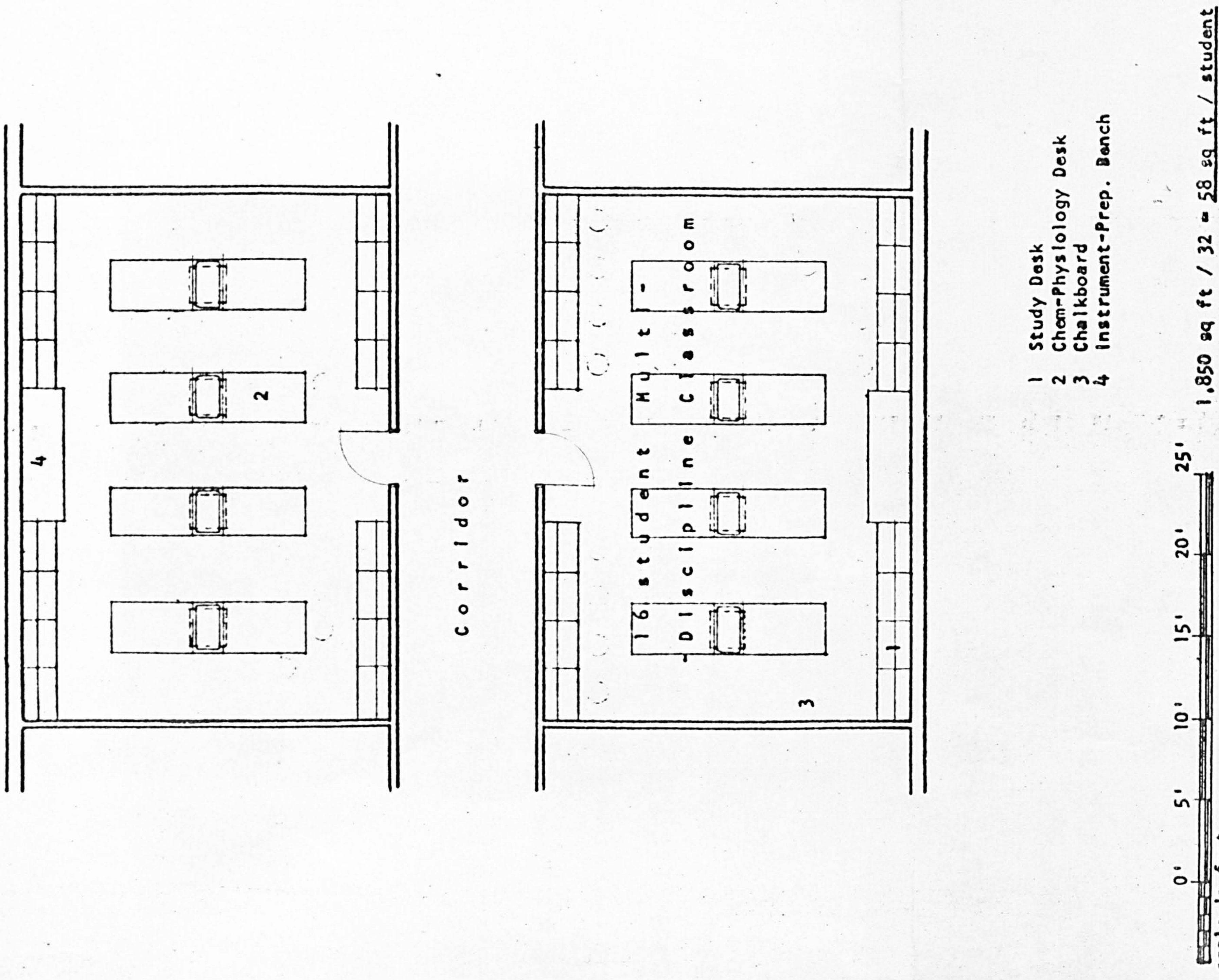


FIGURE 23. WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE: Phase 1 multidiscipline teaching laboratories.



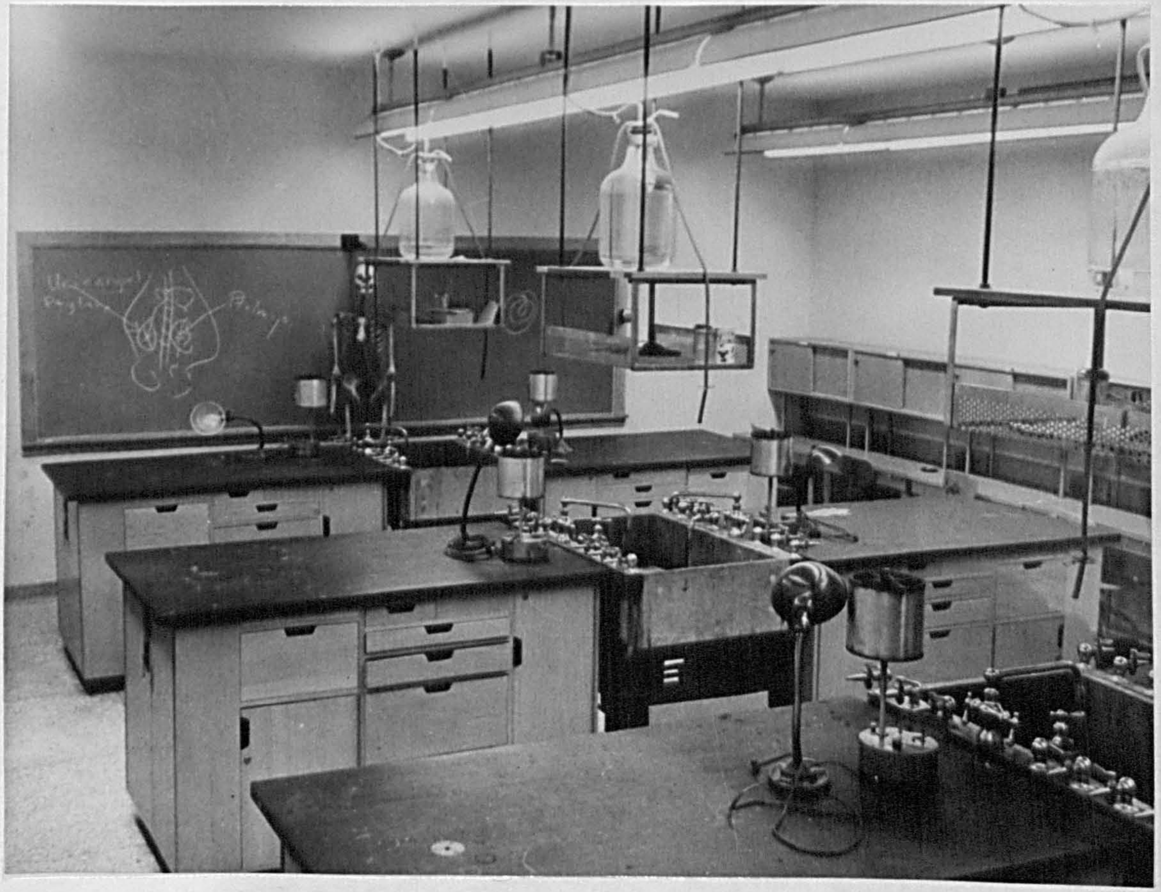


FIGURE 24: Western Reserve School of Medicine, Phase 1 multi-discipline teaching laboratory. Source: Western Reserve Alumini Bulletin, 2057.

FIGURE 25a: Western Reserve Phase 2A teaching laboratory.
Source: Western Reserve Alumini Bulletin, 2057.

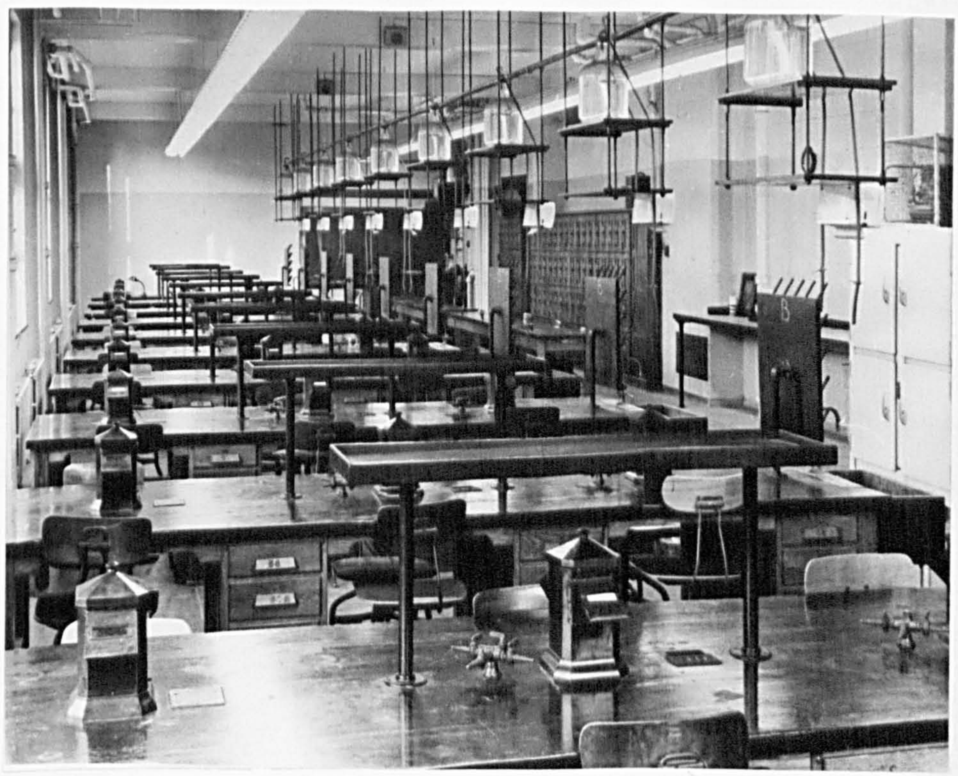


FIGURE 25b: Western Reserve Phase 2B teaching laboratory.
Source: ibid.

STANFORD MEDICAL CENTRE, PALO ALTO, CALIFORNIA

The first medical school on the North American west coast was established in San Fransisco, 1859, by Dr. Samuel Elias Cooper. In 1908, the Cooper Medical College was incorporated into the Stanford University, and after this time, medical students received their preclinical training at the University some 30 miles south of San Fransisco, and their clinical training at the Stanford Lane Hospital in San Fransisco. The population of the area surrounding the University was insufficient to warrant the erection of an hospital which would provide teaching for clinical students. No decision was taken to rectify the position until 1953.

A post-war population explosion in California (especially in the area around Palo Alto), and in recognition of a broad division existing between the basic sciences and hospital clerkship, the Board of Trustees of the University decided to relocate the whole medical school on the University campus. Just as at Western Reserve, the medical curriculum had become overcrowded, inflexible, and overemphasized the didactic approach. For this reason, the Trustees wished to develop a new curriculum better suited to future needs of the medical profession; at the same time, they were desirous of building a new medical school in conjunction with the curriculum programme. They also recognized the importance of the Western Reserve example.

FACTORS INFLUENCING THE DESIGN OF THE STANFORD MEDICAL CENTRE

THE EDUCATIONAL PLAN

The curriculum was based on three major concepts: Firstly, all education is continuous, and as a consequence, clinical and preclinical training should be integrated in such a manner as to encourage a greater individual contribution by the student, and in order to develop areas in the curriculum which can be related to his previous educational experience. Secondly, medical science is expanding so much and so rapidly, that students cannot possibly comprehend all of its facets; there is,albeit, a fundamental core of knowledge which all students can and must learn - this core should be presented by means of subject areas rather than as isolated departmental subjects. Thirdly, the American undergraduate medical student is normally of graduate age and should be encouraged to "learn in terms of attitudes toward, and approach to problems in medicine"[1] rather than by the mere acquisition of factual data.

The Stanford faculty formulated the following broad objectives:[2]

1. To bring medical education into the University environment as a continuation of general education and to relate the medical sciences to other fields of knowledge.

2. To provide all students with a basic core, or a fundamental knowledge of the medical sciences, simultaneously, enoouraging each student to develop as an individual in line with his abilities and interests.

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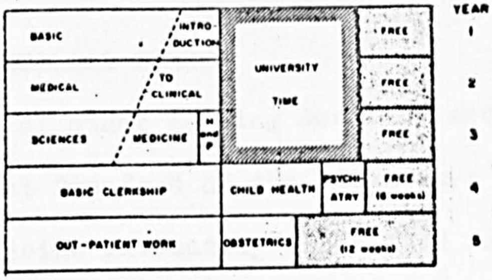
1. & 2. Stowe L. M. Journal of Medical Education, November 1959, Vol. 34, p.p. 1060.

3. To emphasize the unity of the medical sciences.
4. To promote in students an awareness of the place of medicine in society, and of the patient and physician as members of society.
5. To produce a practitioner of medicine with a scientific approach to problems in clinical medicine.
6. To encourage interested students to take up academic medicine as a career.
7. To foster a graduate approach to medical education.

The present medical course at Stanford is of five years duration - 3 years Basic Sciences and 2 years Clinical Sciences. A substantial period designated "University Time" is divided equally between the 3 "Preclinical" years and is designed to enable those students entering medical school without a baccalaureate degree to fulfil these requirements. For other students, this period in conjunction with that designated "Free Time", enables them to pursue individual research interests or other types of investigation. From the time that he first enters medical school, the student is progressively introduced to Clinical medicine and to his clerkships in the final two years. The Clinical course is specifically designed to make him aware of the relationships existing between Clinical departments, and the dependence of these and the many other aspects of his learning upon each other. Special emphasis throughout is placed on the importance of the patient as an individual and not only as "clinical material". Stanford inaugurated its educational plan in the academic year of 1959.

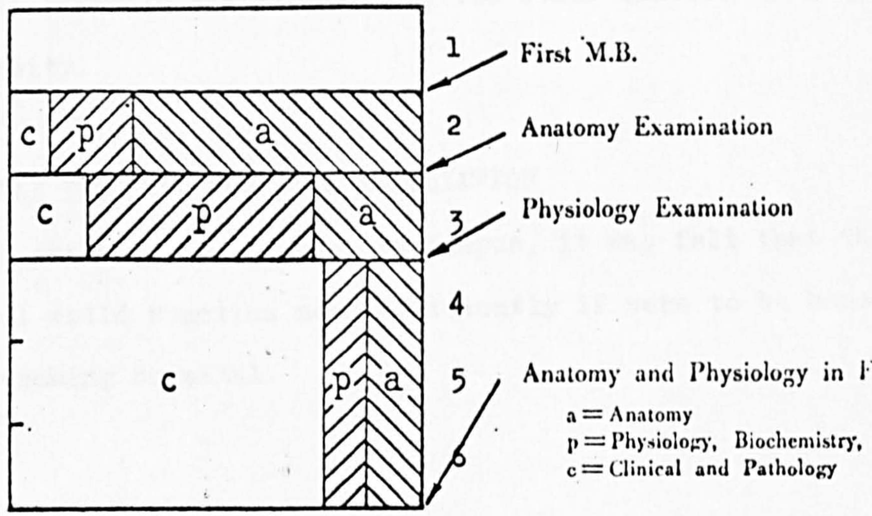
FIGURE 26. Diagramatic representation of curricula of Stanford, Salisbury, & Florida medical schools.

a. Stanford

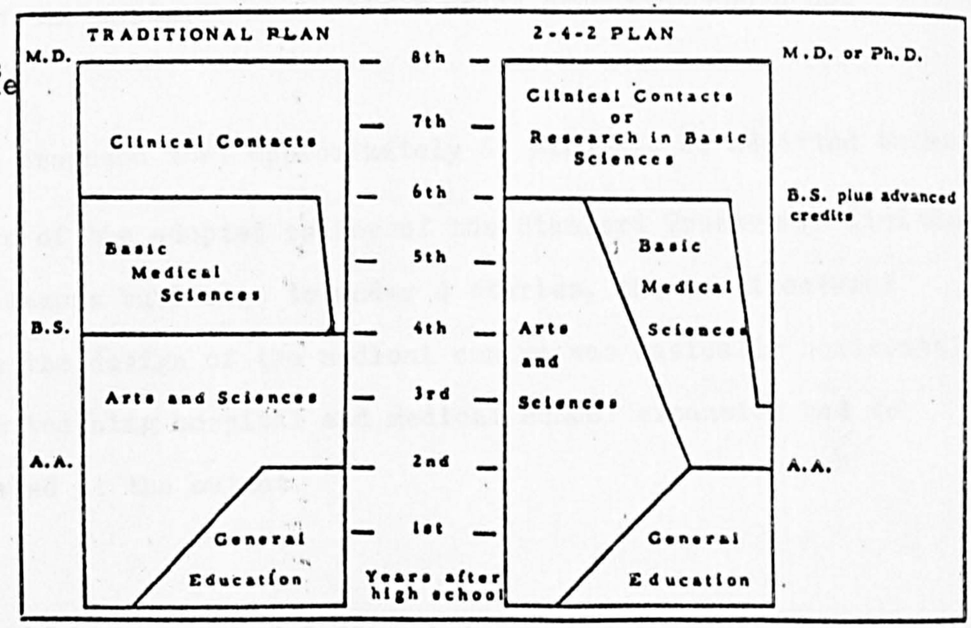


"H" and "P" refer to Historical and Philosophical aspects of medicine.

b. Salisbury, Sthn. Rhodesia



c. Florida-Gainesville



Source: Journal of Medical Education - a. Nov. '59, Vol. 34, p.p. 1061; c. May '56, Vol 31, p.p. 320; b. The Central African Journal of Medicine, Supplement to Vol. 5, No. 3, 1959

A UNIVERSITY MEDICAL SCHOOL

Examples of other leading American medical schools convinced the Trustees at Stanford of the advantages to be gained in having a school of medicine intimately associated with the University, not only for the benefits derived by the medical school, but, by what could be the medical school's contribution to the other schools and departments of the University.

MEDICAL SCHOOL/ TEACHING HOSPITAL AFFILIATION

Although sited on the University campus, it was felt that the medical school would function more efficiently if were to be housed within the teaching hospital.

GENERAL

- In carrying out a plan to improve graduation standards, the interests of the graduate student's further education could not be ignored.
- It was proposed that approximately 65 students be admitted annually.
- Because of the adopted policy of the Stanford Trustees in limiting Stanford's campus buildings to under 4 stories, the architectural approach to the design of the medical centre was basically horizontal.
- Future teaching hospital and medical school expansion had to be anticipated at the outset.

THE ARCHITECTURAL INTERPRETATION (Figs. 27, 28, 29, 31a):

Stanford Medical Centre is a 40' high, 3 storey structure, designed to make full use of the Californian landscape. A 4th basement floor utilizes the many open courtyards and patios which are a feature of the plan. The building complex comprises 7 main units - Palo Alto and Stanford Pavilions, Hospital Core, Boswell, Lane, and Edwards Buildings, and the Medical School. Future expansion will be to the north of the Teaching Hospital and to the south of the Medical School. The complex is adequately served by wide corridors, and so far as is practicable, the circulation around public areas is divorced from that of the hospital services. Vertical traffic is handled by a high speed escalator and 4 lifts in the Core Building; there are 4 other service lifts. In the preliminary design stages it was recognized that expenditure on lifts,although initially high, was justified by an ultimate efficiency of staff movements.

Palo Alto and Stanford Buildings: The Teaching Hospital contains 475 beds which are housed mainly in two "racetrack" ward wings on the three main floors; there are approximately 68 beds per floor - 20 two-bed, 4 five-bed, and 8 single-bed wards. Future expansion is planned for 1000 beds. Nursing stations on all floors are centrally located, with a solarium at the outer end of the wing and a visitors' lounge at the other.

Core Building: It houses the medical and service facilities for the hospital and clinics.

Boswell Building: The central Boswell Building is the largest unit of the complex, and houses most of the outpatient departments (with a capacity of 100,000 visits annually). Central offices and staff laboratories for Medicine, Surgery, Obstetrics, Gynaecology, and Paediatrics are also to be found here, relating horizontally to the adjacent inpatient hospital facilities.

Lane Building: In recognition of the need for centralized library facilities in a teaching hospital, the two level hospital library was located in the Lane Building where it will not retard Medical School expansion, and,where the library itself will be capable of a limited growth. The library employs the "open stack" storage system with open reading areas, both of which permit free student circulation; additionally, there are carrels and small study conference rooms which Dean Robert H. Alway feels should be increased in number.(1) The remainder of the Lane Building contains pathology and pharmacological research laboratories, and some student multidiscipline teaching laboratories.

Edwards Building: This section houses some of the newer specialist clinics. Two floors are allocated to the rehabilitation services - physical medicine, orthopaedics, speech pathology and audiology, otorhinolaryngology, neurology, and neurosurgery. The other floor is given over to a programme dealing with the consequences of disease (studied by undergraduates, doctors, physical therapists, speech and hearing therapists in the care and investigation of patients).

1. Bell G. H. Hospital and Medical School Design. Report on an International Symposium at Dundee, 1961; p.p. 81.

Medical School: Apart from gross anatomy, all instruction on the Basic Sciences is undertaken in the Max. C. Fleischmann multidiscipline laboratories which are mainly grouped in the Medical School. The principle of grouping is also applied to 6 lecture theatres which are located below the Fleischmann laboratories. Two theatres have seating capacities of 138 and 104 students and are designed for Preclinical and Clinical demonstrations; there are two medium size theatres for 84 students and two others for 42 students. The grouping of these components was felt to be economical, helping also to avoid departmental isolation which is customary in many schools. Dean Alway considers that the lecture theatres satisfy most student requirements, but if money had been available, a 400 - 500 capacity auditorium would have been a useful addition.(1) The Medical School Building also contains laboratories for biochemistry and genetics, plus facilities for students registered in nursing.

1. Bell G. H. Hospital and Medical School Design. Report on an International Symposium at Dundee, 1961; p.p. 82.

MAX C. FLEISCHMANN MULTIDISCIPLINE LABORATORIES (Figs. 30, 31b)

The Stanford Trustees had long felt the need of a closer integration of thé Basic Sciences. Western Reserve University had shown the benefits which might be derived by students being instructed by "Subject Committees", as opposed to isolated departmental instruction. In consideration of the second of its Educational Plan concepts, the Trustees came to the conclusion that student laboratories of the Western Reserve type would be the most suitable for providing an environment for the furnishing of basic core material.

The whole of the Medical School 1st floor (plus some of the Lane Building) was designed for 12 laboratory units to accommodate 3 classes of 64 students (16 students per unit). The Department was to be an autonomous unit, administered by a Director (Frederick A. Furhman) who would also be responsible for coordinating the whole Basic Sciences programme. The Director's research area has been located immediately adjacent to the student laboratories rather than in any of the Medical School's departments.

At present, the laboratories are staffed by an assistant director (post doctoral), 4 technicians, a secretary, a stockroom supervisor, and maintenance personnel. The normal teaching procedure is for departmental staff to initiate early experiments which can then be used as a prototype for laboratory staff to assemble and demonstrate to the students. By this method, orders for equipment, supplies, solutions, and animals are minimized and reduce the time normally required of the departmental staff.

Students are allocated a place in the laboratory which is solely for their individual use, at any time of the day. Results so far indicate that the student "home" is proving a success, and productive stimulation to individual self-education and research. Laboratory floor space is used economically, and it is seldom necessary for a student to leave his "home base".

Each 16 student laboratory unit is 36' x 22', although Dr. Fuhrman considers that this could be improved if it were to be increased to 36' x 24' as originally planned.(1) Teaching laboratories are designed in pairs, separated by a 36' x 13' "interlab" containing less frequently used equipment; this smaller laboratory provides space for students undertaking special experiments, and may also be used for the preparation of demonstration material.

Other supplementary teaching laboratory accommodation includes - a human experimental laboratory, balance rooms, "walk-in" regulated temperature rooms, readily accessible animal quarters, glass washing, media preparation, photography, and a large stock room. There are also offices for drafting, administration and secretarial work.

One of the most ambitious and expensive items in the Fleischmann Laboratory programme was the provision of teaching laboratory equipment which was specifically designed for student use. The faculty rejected a traditional policy of introducing medical students to laboratory medicine with simple instruments - which are frequently outdated and inefficient for their purpose. A belief that "medical students are quite capable of using modern research instruments to good effect ... <u>in a mechanised, automated, electronic civilization"</u>(2) committed the

1. Bell G. H. Hospital and Medical School Design. 1961. p.p. 82.
2. Goldstein A. Journal of Medical Education, June 1961, Vol. 36, p.p. 689.

medical faculty to a sizable expenditure compared with the cost of equipment normally provided in most medical schools. Stanford's philosophy that equipment of this nature is necessary for a "first rate" modern education, has been affirmed in recent years by the ease with which their students have adapted themselves to its use.

STANFORD CRITIQUE

Cons:

- The initial cost of providing teaching laboratories was high.
- Dr. Fuhrman considers that the multidiscipline laboratories would operate better at 36' x 24' in lieu of the present size of 36' x 22'.
- He also favours the provision of an additional large auditorium for 400 - 500 students, and more library study carrels.
- Laboratory space is lacking for student experiments - some of these it has been found, cannot be carried out in either the teaching laboratories or in the faculty research units.

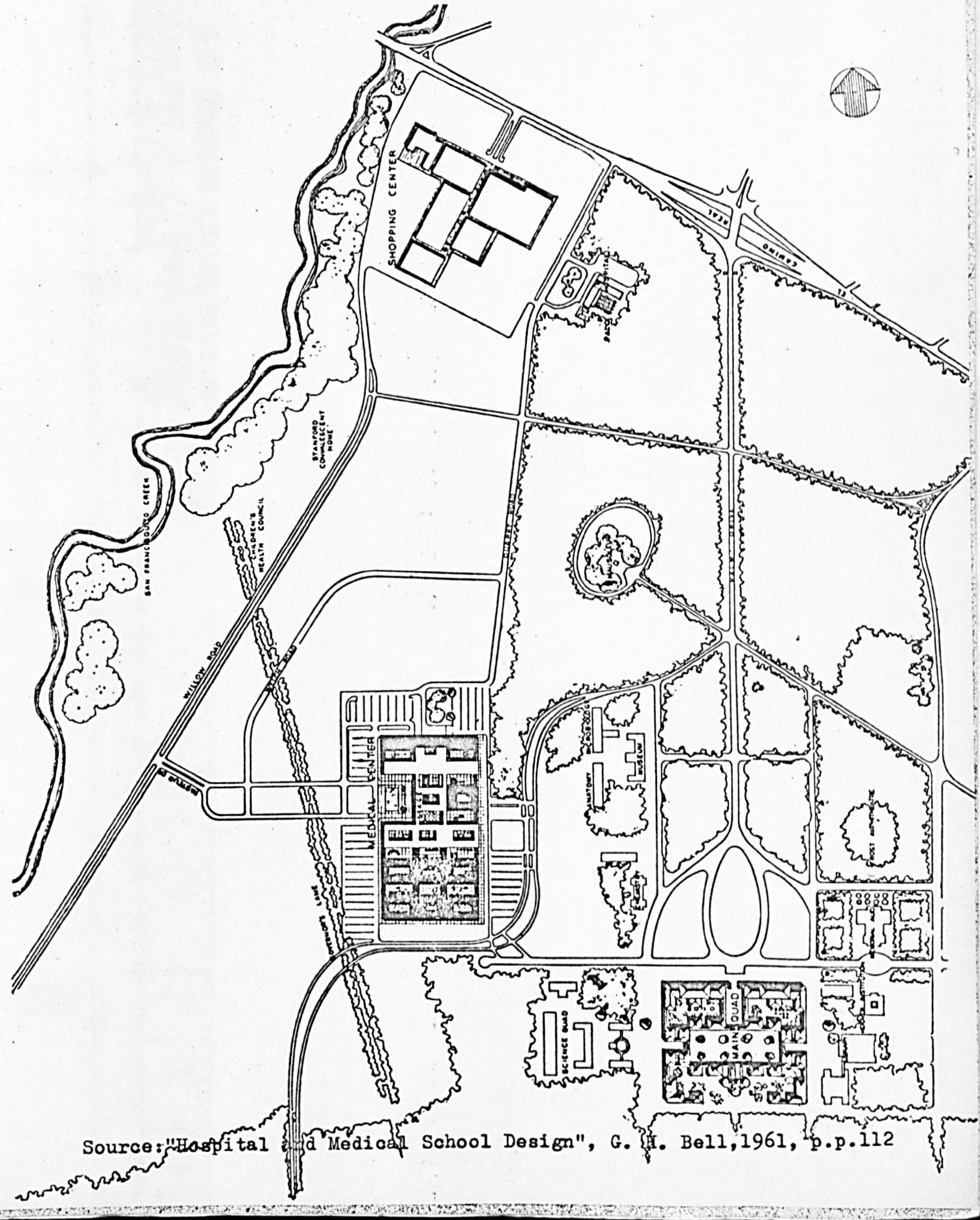
Pros:

- Conjoint laboratory teaching has been found to be conducive to the provision of "basic core" material.
- Student circulation is minimized.
- Departmental staff preparation time is minimized, and demonstrations efficiently performed by fully trained laboratory staff.
- There is maximum space utilization of teaching laboratories due their full-time occupation.
- Students are given access to the laboratories at all times, providing an incentive for private study and research.
- Equipment is modern, and specifically designed for student use.

Architects: Edward D. Stone & Associates.

Laboratory furniture was designed by the architects and manufactured by Weber Showcase Company, Grand Rapids, Michigan.

FIGURE 27. STANFORD MEDICAL CENTRE, PALO ALTO, CALIFORNIA: Relationship of Medical Centre to campus and surrounding area.



Source: "Hospital and Medical School Design", G. H. Bell, 1961, p.p.112

FIGURE 28. STANFORD MEDICAL CENTRE, PALO ALTO FIRST FLOOR PLAN

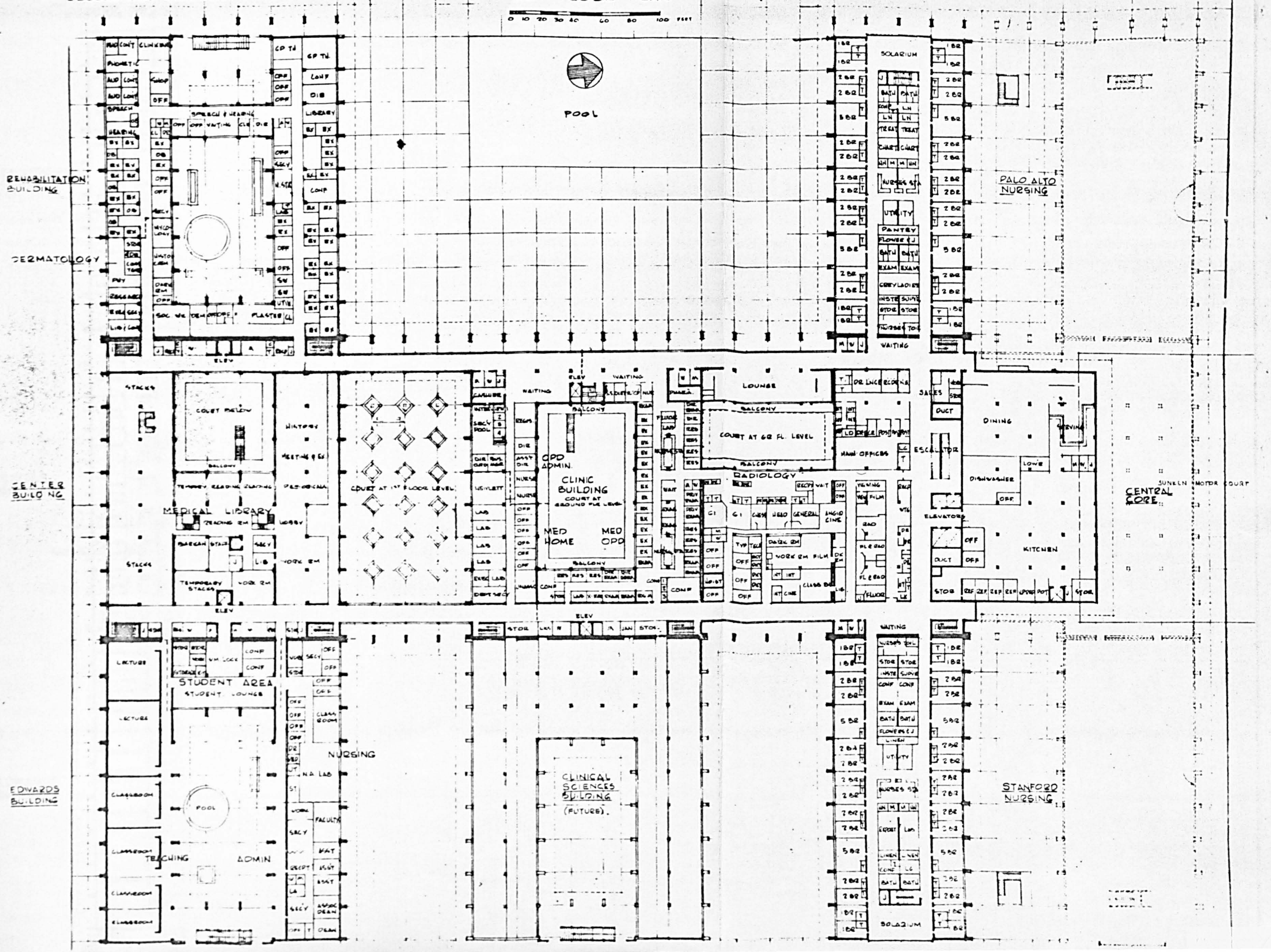


FIGURE 29. STANFORD MEDICAL CENTRE.

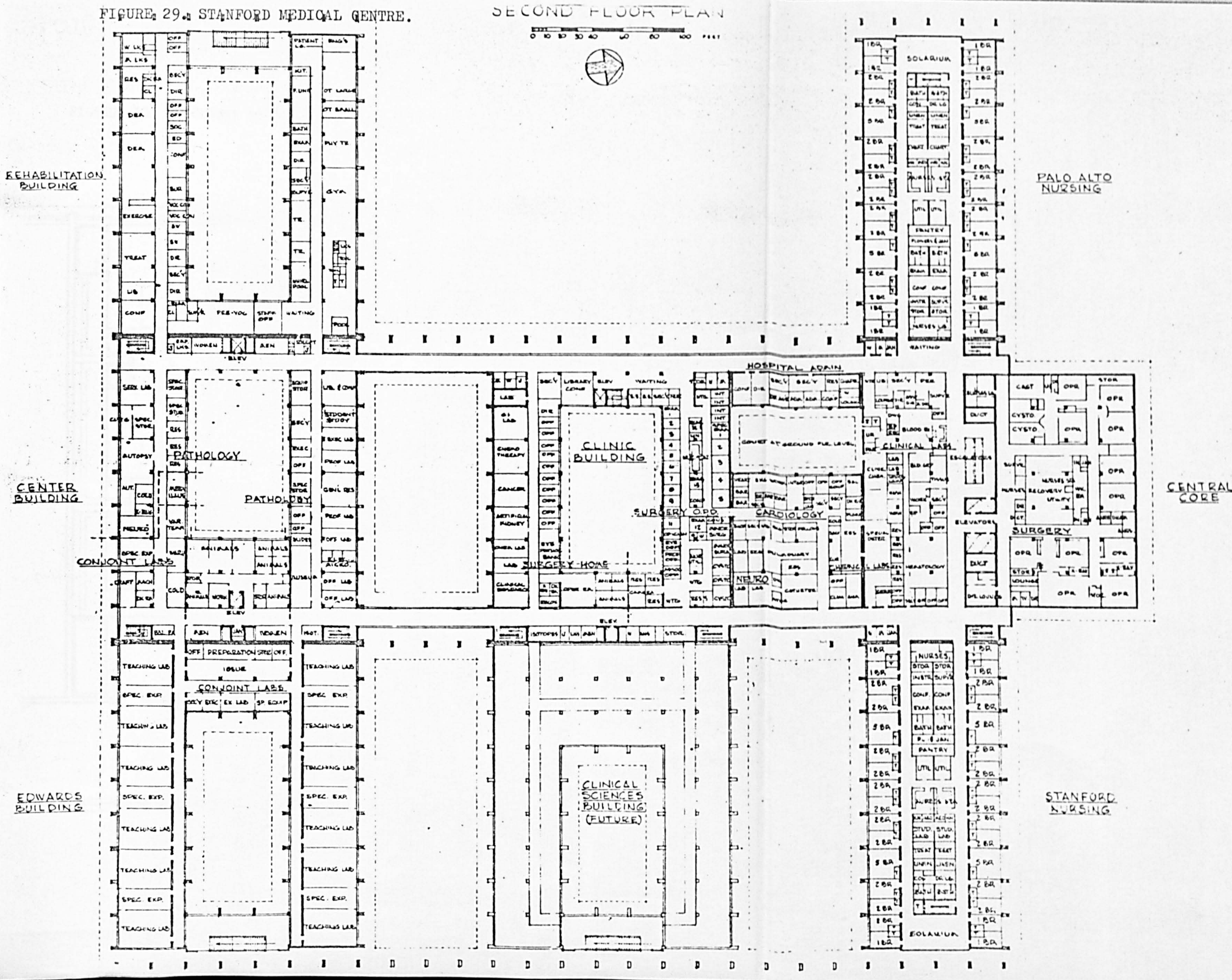
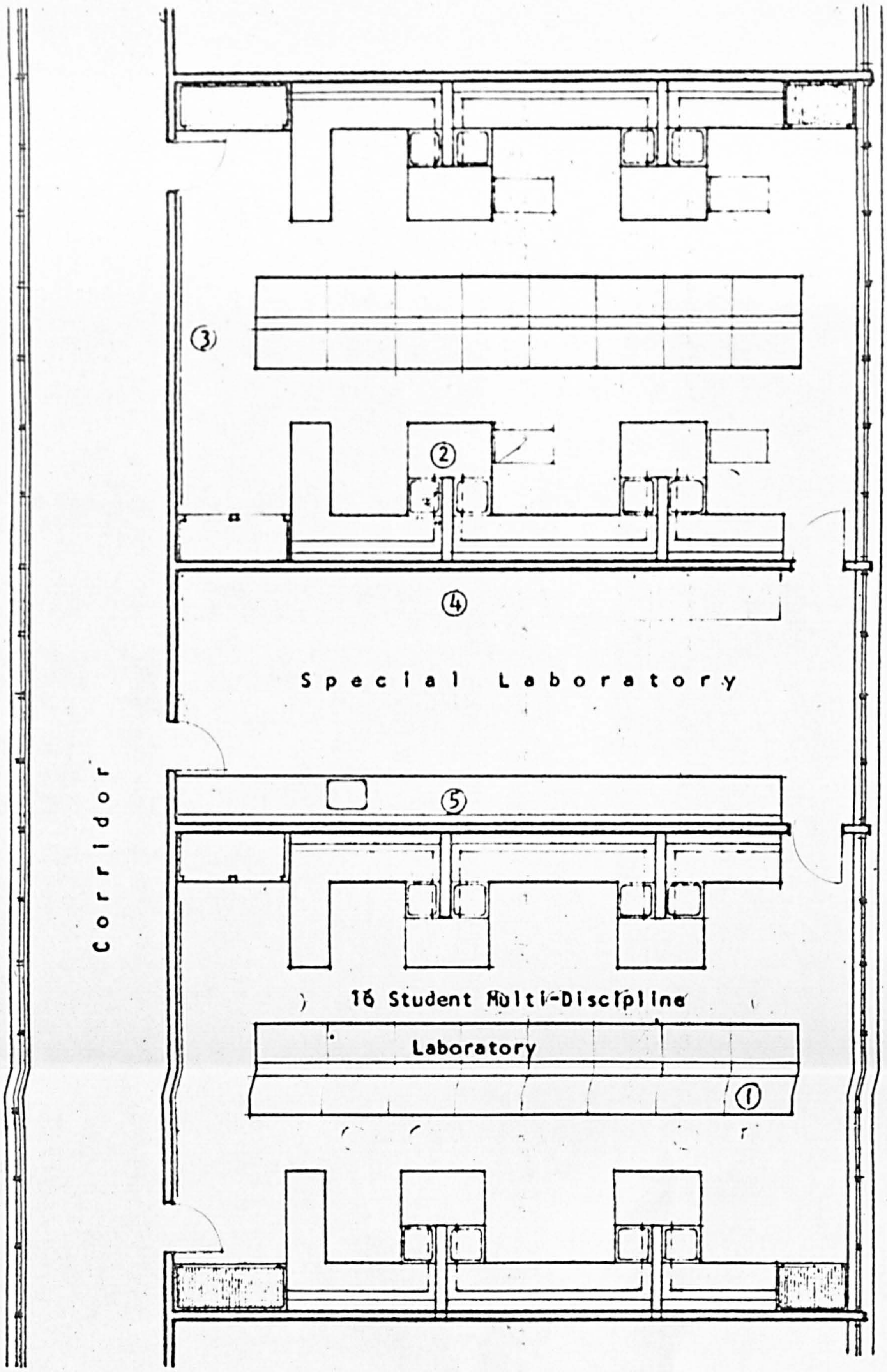


FIGURE 30. STANFORD MEDICAL CENTRE: Plan of multidiscipline teaching laboratories



① Study Desk
② Chem-Physiology Desk
③ Chalkboard
④ Floor Standing Equipment
⑤ Instrument-Prep. Bench

0' 5' 10' 15' 20' 25'

scale in feet

3,100 sq ft/ 32 = 97 sq ft / student

FIGURE 31a: Stanford Medical Centre. View of forecourt and pool. Source: International Hospital Federation News Bulletin, December 1960, p.p. 9.

FIGURE 31b. Stanford School of Medicine, Max C. Fleischmann multidiscipline teaching laboratory. Source: Frederick A. Fuhrman, Director, Fleischmann Laboratories.

UNIVERSITY OF FLORIDA-GAINESVILLE, COLLEGE OF MEDICINE

The Florida medical school, like Stanford, arose out of necessity in the rapidly expanding Florida community. Student numbers for the whole University of Florida increased by 561% between 1930 and 1950, although this rate of growth was insufficient to cope with the State's phenomenal population development in the same period. Dr. J. Hilles Miller, the then President of the Florida University, perceived that the university must expand still further. He also recognized that there was an outstanding need of a new university medical school which the State of Florida did not possess.

To this end, the Lippard Committee (appointed by the State), after investigating the most suitable location for such an institution, recommended a site at Gainesville on the campus of the University of Florida. A grant from the Commonwealth Fund had enabled the Committee to carry out a study into the problems of medical education and the methods by which a medical school could best serve the community. The most important of its findings had been, that "a real functional integration of the medical school with the rest of the university is clearly indicated."(1)

The Curriculum: Many American educators are concerned at the cleavage between the Basic and the Clinical Sciences in the courses of most medical schools. Dr. Arnold B. Grobman, a member of the Commonwealth Fund Committee, was even more concerned at the division of the American arts and medical courses,(2) the arts being regarded as an academic

1.& 2. Grobman A. B. Journal of Medical Education, May 1956, Vol. 31, p.p. 316 - 322.

hurdle by potential medical students. As a means of combatting this danger, Florida contemplated the introduction of an integrated 8 year course, popularly called the "2 - 4 - 2 Plan", in lieu of the normal 4 year arts/ 4 year medical course (see Fig. 26c).

Staff: For the new medical school, the selection of medical staff was based on a number of factors: teaching ability and research potential were the main factors; others were, qualifications, youth, and enthusiasm. Initially, there were to be 80 staff in the Basic Sciences and 78 staff in the Clinical Sciences (including 33 practising physicians).

Students: The first class of 47 students graduated in 1960; there were 3 women in this number. 7 students of the original intake did not complete the course. The student/ staff ratio was 1.3 : 1 in both the Basic and the Clinical Sciences. The Florida medical course places some emphasis on the psychological aspects of illness. The 4th year Clinical students spend a good part of their time in the outpatient clinic, but otherwise, Florida's approach to medical teaching is similar in most respects to the general course in this country. Basically Florida is a referral hospital. It accommodates 400 beds, giving a beds/ Clinical student ratio of 4 - 4.5 : 1. There is a complete internship and residency programme for postgraduate students in the teaching hospital. As shown in Fig. 32, there are a number of rooms provided for postgraduate study, plus, a postgraduate lecture room primarily intended for the seminar type instruction of practising physicians in the area who may come for periods of 3 or 4 days.

THE ARCHITECTURAL INTERPRETATION (Figs. 32, 33, 35a):

The medical centre is located on the periphery of the main university campus to enable sufficient scope for the development of the Health Centre activities, and, to place it in relation to the main road in order to facilitate easy patient patient access to the hospital. It is still close enough to the main university for the convenience of student and other interrelated faculty activities.

The medical school (Basic and Clinical Sciences) was built before the actual teaching hospital: the medical school admitted its first year on 8th September, 1956, and the teaching hospital was opened on 20th October, 1958. The medical centre complex at Florida shows a clearer physical definition of medical school and teaching hospital than do the medical centres discussed in the previous chapter. The Florida teaching hospital and medical school have been planned, nonetheless, as an integrated complex which, as pointed out by Dean George T. Harrell, "should be thought of as one educational unit".[1]

The 7 storey medical school is a long building with the Basic Science departments in the west wing, and the Clinical departments housed in the east wing where they communicate directly, by a connecting link, with the teaching hospital. As far as possible, the Clinical and the Basic Sciences have been functionally related in order that their teaching and research activities will be complementary, and to help the medical student "to think of both clinical and preclinical areas as different facets of medicine as a whole".[2] On the 2nd floor, for example, the Anatomy Department is sited in relation to the surgical

1. Personal communication from Dean Harrell.

2. Harrell G. T. Reprint from the Journal of the Florida Medical Association, September 1957, Vol. 44, p.p. 254 - 260.

specialties Urology, Orthopaedics, and Neurosurgery; all of these specialties can help in the teaching of anatomy. Primarily, the medical school building is a vertical concept communicating between floors by two vertical axes, one at the east end for nursing and other activities related to Clinical medicine, and the other in the centre of the building for the staff and the students of the medical school. A summary of the various floors and medical school departments is as follows:

Ground Floor: Medical School: P.B.X. and Post Office, library, locker rooms, workshops, general storage, animal house, loading bay. Teaching Hospital: kitchen, housekeeping and workshops, central stores, rehabilitation, radiotherapy.

1st Floor (Fig. 32): Medical School: main entrance, administration, library (upper part), postgraduate lecture room and seminar room, study cubicles (undergraduates), student amenities, the Clinical department of preventive medicine. Teaching Hospital: public areas, administration, study cubicles, outpatient clinic, emergency rooms and blood bank.

2nd Floor: Medical School: lecture theatre, Clinical departments of urology, orthopaedics, neurosurgery, plus lecture room, Basic Science department of anatomy. Teaching Hospital: surgery, pharmacy, central supply, radiology, diagnostic clinic.

3rd Floor: Medical School: Clinical departments of psychiatry, obstetrics, paediatrics, plus lecture room, Basic Science department of biochemistry. Teaching Hospital (Fig. 9): maternity floor including the delivery suite and ambulant wing.

4th Floor: Medical School: Clinical department of medicine, plus lecture theatre, Basic Science department of microbiology. Teaching Hospital: patient floor, hospital laboratories.

5th Floor (Fig. 33): Medical School: surgical specialties, Basic Science departments of physiology and pharmacology. Teaching Hospital: patient floor, nursing education.

6th Floor: Medical School: medical illustration, department of surgery, department of pathology. Teaching Hospital: patient floor, staff auditorium, medical photography.

Dean Harrell[1] lists the following "unique" features of the hospital: the ambulant floor, the design of the individual examining rooms in the outpatient clinic, the organization of teaching facilities on each hospital floor, the small teaching apartments on the acute floors, and the clinics. These are listed for reference only; they will not be discussed. The main architectural features of the medical school are its departmental teaching laboratories and the central study cubicles.

THE STUDENT "HOME":

The principle of the multidiscipline laboratory devised originally by the Western Reserve medical school was that of containing all "wet" and "dry" student activities in one room, by making provision for a combination of the "dry" study function at sit down desks and "wet" laboratory activities at stand-up benches.

1. Personal communication.

It is the philosophy of the Florida medical school that: (1) The bibliographic or laboratory approach to the solution of Clinical medical problems should not be over emphasized. (2) The study function should be separated from the teaching laboratory. It was deliberate, therefore, that the study cubicles provided for the study function should not be placed in the teaching laboratory or in the library - as are study carrels, traditionally, in the humanities and the liberal arts.

Multipurpose Teaching Laboratories (Figs. 34a, 35a):

The term is, perhaps, more appropriate for the teaching laboratories of the Florida medical school than that used previously to describe the teaching laboratories of Western Reserve and Stanford.[1] The teaching laboratories at Florida are provided for separate departments, or alternatively, they are shared by two Basic Science departments. The laboratories themselves are something of a combination of the traditional teaching laboratory and a multidiscipline laboratory; they are similar to the laboratory recommended by the U.S. Dept. of H.E.W.[2] (Fig. 13).

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1. In recent personal correspondence (26th March, 1964), Dean Harrell has intimated that there are current proposals to adapt a multipurpose teaching laboratory for use as a multidiscipline laboratory. It cannot be reproduced here, but a description will appear in the American Journal of Medical Education sometime in the summer (1964).

2. It is likely that there would be a similarity between the Florida teaching laboratories and that of the U.S. Dept. of H.E.W. Dean Harrell of the Florida medical school is also chairman of the Committee responsible for the publication "Medical School Facilities".

Each departmental laboratory accommodates up to 64 students who may be taught as one large class, or, in groups of 16 or more students. The laboratories provide 45 sq.ft./ student. All laboratories are capable of division by movable partitions into two, three, or four units; maximum flexibility in the laboratory area is provided by work benches on casters.

Florida's teaching laboratories have been arranged to provide sit-down benches on the even numbered floors and stand-up benches on the odd numbered floors. In general, sit-down benches are provided for the departments of microbiology, micro and neuro anatomy, and pathology; stand-up benches are provided for the departments of physiology, pharmacology, and biochemistry. Stand-up benches for demonstrations are also located along the window walls of all teaching laboratories.

Study Cubicles (Figs. 34b & c, 35c):

> "A study cubicle has been designed so that the student may start on his first day in medical school the pattern of thinking he will follow for the remainder of his professional life" (1)

The cubicles are grouped and arranged in "streets" at rightangles to and on opposite sides of a central aisle. Cubicle streets are arranged to face in opposite directions in order to provide the student with maximum privacy. The lockers shown in the illustration were planned originally on the other side of the desk, but the arrangement was modified subsequently to give the student more privacy. Different cubicle "streets" of from 6 to 10 desks have been tried, and they have all been found to operate with equal efficiency.

1. Harrell G. T. Reprint from the Journal of the Florida Medical Association, September 195', Vol. 44, p.p. 4.

Study cubicles are available to students on a 24 hour/ 7 day week basis, and the only time that the students are required to change places is when transferring from the Basic Sciences to the Clinical Sciences.

The cubicles are provided for Basic Science students on the first floor of the medical school. For Clinical students, the cubicles are housed in the teaching hospital, but they are also situated on the same floor as Basic Sciences cubicles. The teaching hospital cubicles are in streets of 10. The Clinical and the Basic Science study cubicles both relate to the teaching laboratories and to the library, but as mentioned previously, they are not located in either; they are equidistant from the library and communicate vertically with the hospital floors or the teaching laboratories. The arrangement has been found to work well.

Adjoining lounges are provided for Basic Science students (up to 50) and Clinical Science students (8 to 10). Basic Science students, it has been found, tend to move en-mass; Clinical students tend to move individually or in small groups, and the respective lounges have been sized accordingly. Initially, it was considered desirable that showers should be provided for students, especially after they have been working in the dissecting area; it has been found that the facilities have only been used moderately. Bulletin and chalkboards in or adjacent to the cubicle areas have been found to be useful. There is a house phone in the lounge areas, and a speaker in the Clinical area connected to the hospital pageing system.

Evaluation on the use of Study Cubicles at Florida:

Since the inauguration of the study cubicles 7 years ago, it has been found that Basic Science students, on average, use the cubicles from 20 to 24 hours per week; the greatest use has occurred in the evenings and the smallest use in the mornings. Clinical study cubicles are occupied for approximately the same length of time as the Basic Science cubicles, but the occupancy has been found to be distributed more evenly throughout the day. One or two students in each class have used the cubicles negligibly. Some married students have preferred to study at home. Graduate students have also requested, and have been assigned to study cubicles in the Basic Science area during the years that they are undertaking courses. They have tended to occupy them more that the undergraduates, with the greatest use occuring in the afternoons followed by the mornings and then the evenings. Some house officers have been allowed to move into the Clinical cubicles. Grouping by the house officers has been discouraged and it has been found that they have integrated successfully with the undergraduate Clinical students. Generally their occupancy has been less than that of the undergraduates, with greatest use occuring in the mornings and equal use occuring in the afternoons and evenings. Consultation cubicles were also built in the o.p.d. Although they have worked well, it has been found that house officers have preferred to use the undergraduate cubicles when they have been out of the clinics because of the greater privacy that they have afforded.

The aerial photograph (Fig. 35c) shows the cubicle bays as they were originally painted (a dusk-grey). The colour was found depressing and bad for light reflection, and they have since been repainted a a pastel green: walls, units, partitions, etc. Originally the decorators considered that some contrast would be necessary to avoid monotony, but later, the students found that this was distracting, and that they preferred a uniform colour.

There was some early criticism of the anticipated cost of providing study cubicles in addition to teaching laboratories. It has been Dean Harrell's impression that the overall amount of space that has been required for the cubicles in the medical school has not been a very large addition to that which would normally be required for student teaching by using traditional teaching laboratories only. For example, the library reading room was cut down in size since it was to be a reference library and not a study hall; no locker room was required, nor was it provided.

Two important conclusions that Florida has made in its evaluation studies are: (1) "students apparently prefer to separate the study and laboratory functions". (2) "experience over a period of seven years indicates the average hours of use justify the allocation of space".[1]

1. Harrell G. T. "Student Study Cubicles". Journal of Medical Education, January 1964, Vol. 39. p.p. 38 & 39.

Lecture Theatres (Figs. 32, 33):

The main auditorium (seating capacity 535) adjoins the Clinical lobby on the east wing of the building. It is frequently used by others and for functions not necessarily connected with the medical school; for this reason, an independent stair entrance has been provided off the main entrance lobby of the medical school at 1st floor level to avoid disrupting normal school activities.

Small stepped lecture rooms are provided on all floors sized to take up to 70 students. They are grouped with the teaching laboratories and the study cubicles in the centre of the building. The small lecture rooms are of two types: Projection Rooms which are located on the even numbered floors and Demonstration Rooms which are located on the odd numbered floors.

Intermediate size classrooms (not stepped) are also provided at the Clinical end of the building, to take a maximum of 50 students. These are intended for use by the College of Nursing and allied health professions, as well as by the Clinical departments. The classrooms and laboratories on all floors have been sized for student groups of 16.

Research Laboratories:

Florida has a particular interest in nuclear science - requiring the use of radioisotopes. Undergraduate students are encouraged to make use of the research laboratory facilities.

Laboratories are designed on a 4'6" module, with modular bench units and 6" pipe ducts to each unit. Research laboratories of two 4'6" modules are provided for a postgraduate student, a house officer, a fellow, or a junior faculty member. Three modules are provided for two to three house officers working together, or for a junior faculty member and a technician. Four modules make up a full-size research laboratory for a specific project, with space for technicians, students, or research assistants. Two modules added to one side of a four module laboratory provide a special instrument room (adaptable to optical recording, tissue culture, etc.), plus a small office for a senior faculty member.

The animal house has been placed on the ground floor west end to facilitate its expansion without disrupting the functioning of the other units. For a similar reason, the library stack room has also been positioned on the ground floor, at the opposite end of the medical school.

Architect to the Board of Control: Guy C. Fulton, Gainesville.

Consultant to the University of Florida: Jefferson M. Hamilton, Gainesville.

Architects - Engineers Consultants: Ellerbe and Company, Saint Paul, Minnesota.

Consulting Engineers - Foundations: Moran, Proctor, Mueser & Rutledge, New York.

FLORIDA CRITIQUE:

Cons:

- The use of study cubicles in addition to the use of teaching laboratories (traditional or multidiscipline) is likely to be more expensive than for teaching laboratories only. However, for reasons put forward by Dean Harrell, this expense can be reduced.

- The Florida medical school is a 7 storey building. The future expansion of some of the school's research laboratories could be difficult.

- Students are allowed access to the research areas. There could be a noise problem.

- Based on Nuffield findings, the 2 and 3 module research laboratories would appear to be wasteful of area in consideration of their respective numbers of occupants.

Pros:

- There is a good students/ staff ratio.

- Basic Science student areas are segregated from the teaching hospital.

- There are good relationships of the Basic and the Clinical Sciences.

- Undergraduate and postgraduate teaching accommodation is generous but not wasteful.

- The school's teaching laboratories appear to provide a combination of the virtues of multi-discipline and traditional teaching laboratories.

- The philosophy and the arrangement of Florida's study cubicles are an interesting, and successful, alternative to the multidiscipline laboratory "wet" and "dry" principle.

- Most of the teaching areas are centralized and they have good vertical communication.

FIGURE 32. J. HILLIS MILLER HEALTH CENTRE, FLORIDA:
Medical Science Building; First floor plan.

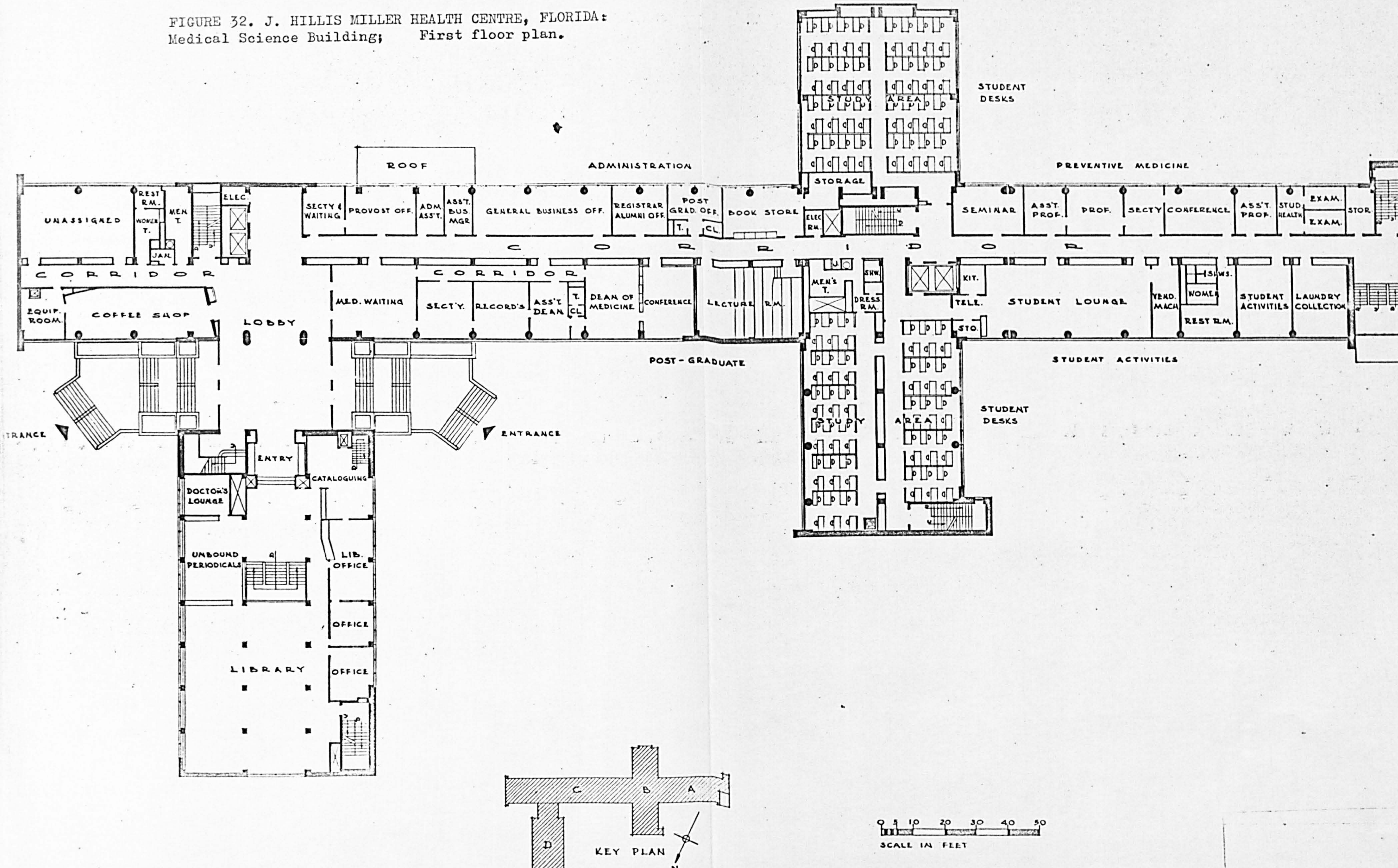
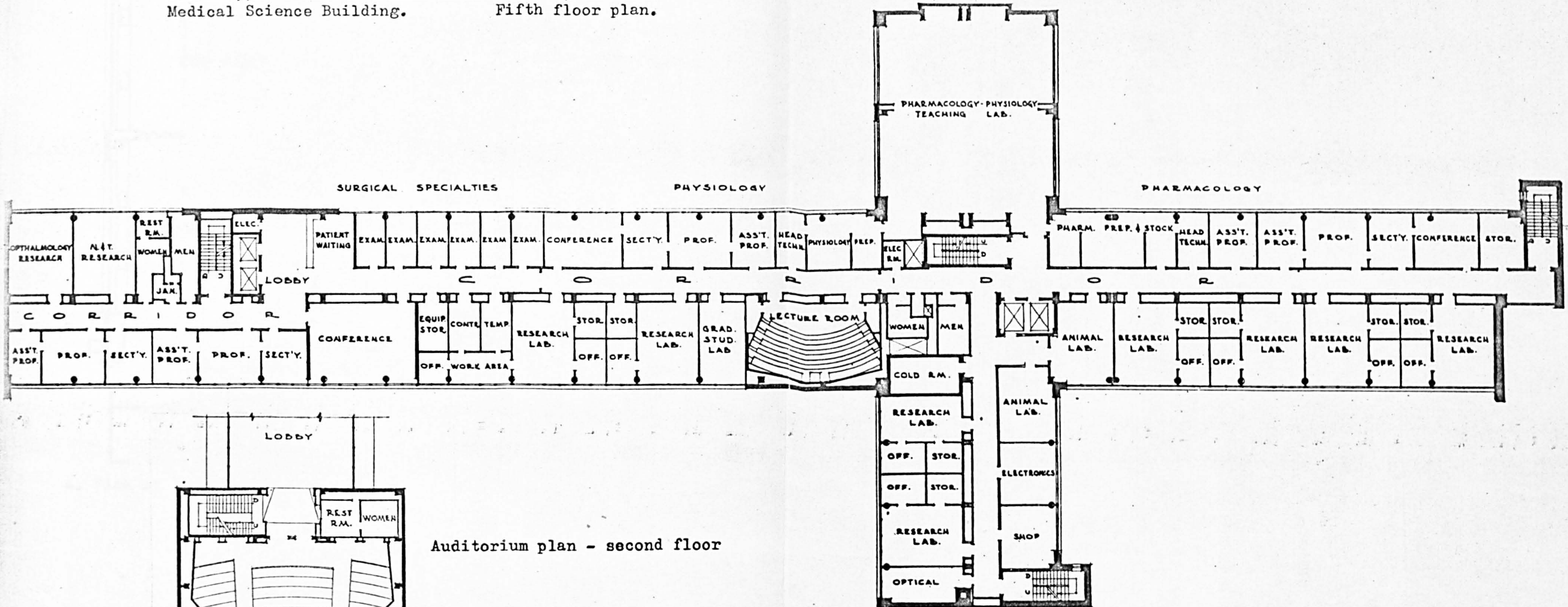
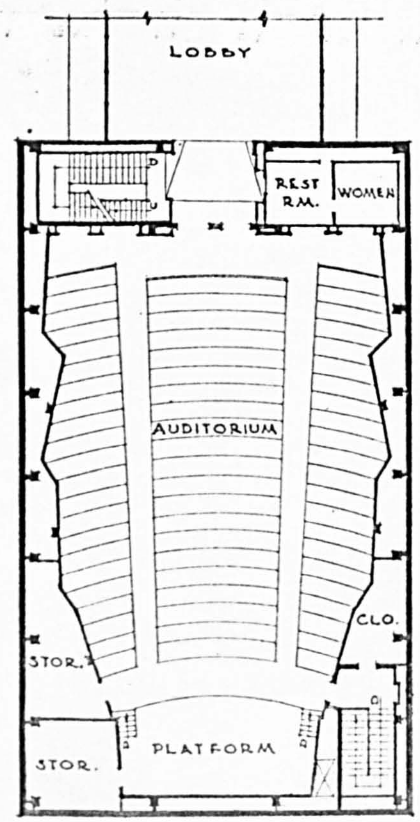
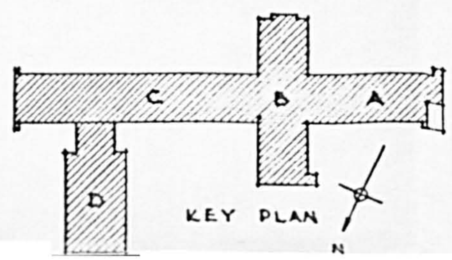


FIGURE 33. J. HILLIS MILLER HEALTH CENTRE, FLORIDA:
Medical Science Building. Fifth floor plan.





Auditorium plan - second floor



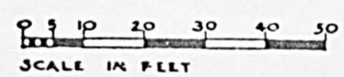
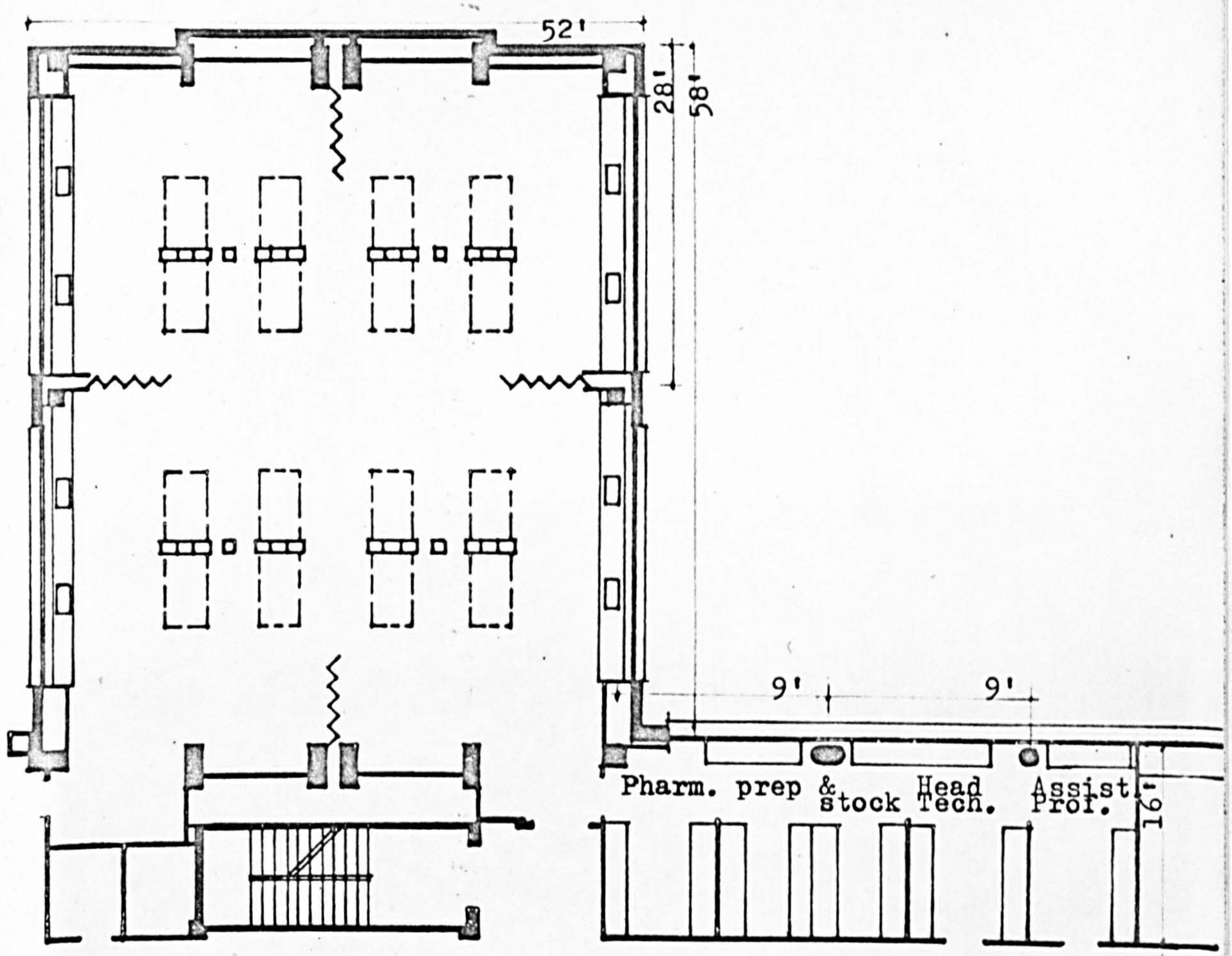
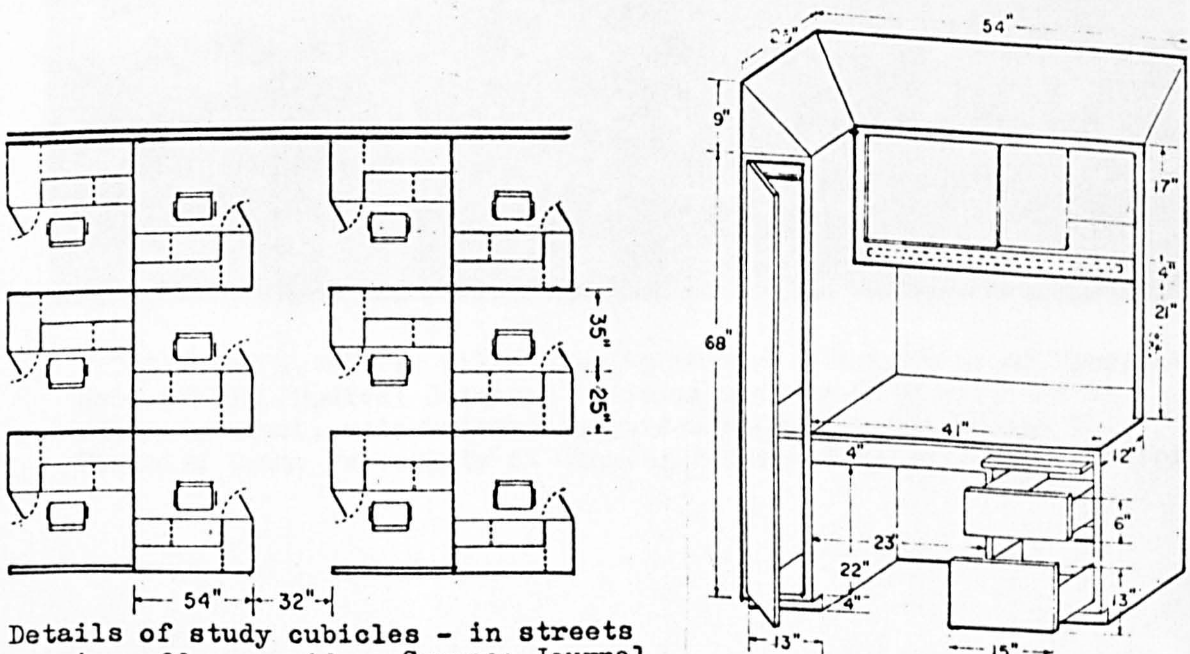


FIGURE 34. UNIVERSITY OF FLORIDA-GAINESVILLE



a. Plan of Pharmacology-Physiology teaching laboratory; scale 1/16" = 1'0"



b. Details of study cubicles - in streets opening off a corridor. Source: Journal of Medical Education, Vol.39, No.1, January 1964.

FIGURE 35a: J. Hillis Miller Health Centre - University of Florida-Gainesville. Medical Sciences building and teaching hospital in centre picture, main university in distance. Source: George T. Harrell, Dean, University of Florida-Gainesville, College of Medicine

FIGURE 35b: Florida Medical School, Pharmacology-Physiology teaching laboratory. Source: George T. Harrell, Dean, Medical School, & B.M.J. September 10th, 1960.

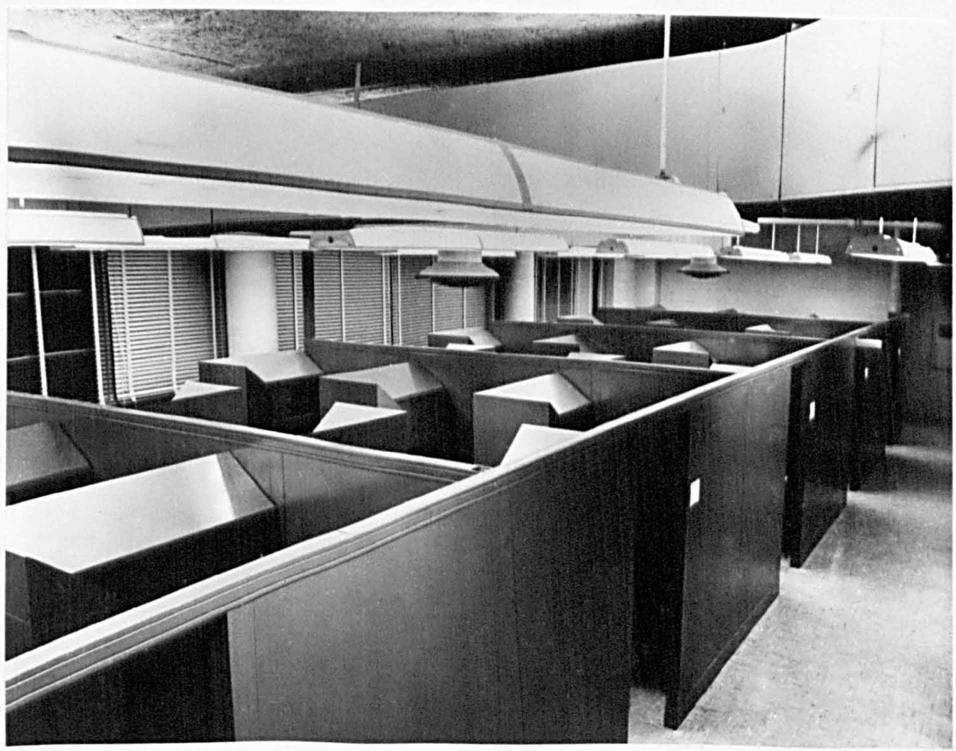


FIGURE 35c: Florida Medical School, student study cubicle bays. Source: George T. Harrell, Dean, Medical School.

DEPARTMENT OF PHYSIOLOGY, BAYLOR UNIVERSITY, TEXAS

In the following discussion, no attempt will be made to examine the teaching philosophy of the whole medical school. Reference will only be made to the teaching laboratory of the Department of Physiology because: (1) it is an extension of the multidiscipline laboratory principle, being one of the foremost of its kind currently in operation, and (2) having regard to earlier remarks, it is indicative of a new role that physiology has to play in present and future medical teaching, and (3) it is pointing the way in the use of instrumentation as an aid in medical education.

"...it is as natural to make the laboratory the centre of teaching in Physiology as it has been to make the bedside the centre of clinical teaching."[1] In coming to this realization, it became apparent to the Department of Physiology that the traditional teaching laboratory "..offered hardly more than the rudiments of its true potentialities .."[1] and that a new approach to physiology teaching was warranted. A "new approach" would require new instruments, new and adequate surroundings, and the latest aids to teaching.

An Instrument Programme:

The principal aim of the Physiology Department was to re-introduce and to extend the graphic method in physiology and medicine. The smoked-drum kymograph is the traditional physiology teaching instrument of some 100 years vintage which placed physiology in a position of some medical distinction in the 19th century. The design of a new

1. Hoff H. E., Geddes L. A., Spencer W. A. Journal of Medical Education, February 1959, Vol. 34, p.p. 107.

instrument would not only have to duplicate the operation of the kymograph but it would also have to incorporate, to the fullest degree, the present day resources of engineering and technology; more specifically, it would be required to give adequate coverage of the heart and circulation, of muscle and nerve respiration, and of the nervous system.

A 3 channel physiograph designed and built in the Department of Physiology under Hebbel E. Hoff, L. A. Geddes, and W. A. Spencer, was the outcome of these requirements. The principle of its operation is an application of data recording techniques commonly in use today. There are three components which go to make up the physiograph: Transducer (or pick-up): it converts the physiological event to an electrical signal. Processor: it operates on the signal to produce an electric signal which is acceptable to a reproducer. Reproducer: it is a graphic recorder.

The Teaching Laboratory (Fig. 36):

The principles taken into account in the design of a new physiology laboratory were generally similar to those of the other schools mentioned previously: elimination of crowding, suppression of noise and interference, provision of illumination appropriate in intensity and quality, ample desk, drawer and cupboard space, and an efficient means of student communication. The architectural interpretation of these principles was also similar in many respects, involving the conversion of an available laboratory area, 100' x 50', into 10 small group laboratories,each 18' x 14'. Provision was also made for a Human Studies Room and a Demonstration Theatre.

The new physiology laboratory was completed in 1956. It had been of some concern to the Physiology Department that a feeling of isolation by students should be avoided by reason of them being separated in each of their laboratory units. To help provide some class identity, semi-opaque glass was used in the partitions between the cubicle units and no doors were provided between the units and the central corridor.

Communications:

The student requires 3 kinds of assistance:

1. Professional: advice in gaining access to the phenomenon under study, supervision, and discussions on findings.
2. Supplies: animals, drugs, and other essentials in connection with the experiments.
3. Technical Assistance: help in setting up apparatus, the use of equipment, and possibly the use of additional equipment throughout the experiment.

The importance of the demonstration in medical teaching was recognized by the Department,and in this respect, it was considered equally important that all students should be able to hear and see the experiments. These experiments should be displayed in as many ways as possible. Small group teaching was acknowledged as an effective means of communication, but its attainment could at times be problematical for medical students, when, because of expense, apparatus, difficult surgery, or other reasons, demonstrations could not be repeated or be reproduced a number of times. The Department felt that here, television could be put to its best advantage.

An amalgam of all of these requirements was realized in the development of a console. The console, which was mounted above the bench at the side of each physiograph, was to be used by students in pairs (see Fig. 37a). By this means, students were able to communicate with the student consoles in each of the other units in the Physiology laboratory.

The first test, programming television, two-way audio, and physiological data, was made on 2nd January, 1960. An expansion of these facilities is forseen in the near future and a master control unit has been designed and constructed to permit reception of the 3 types of communication from the other departments in the medical school, and from nearby hospitals.

On the left of each console there is an annunciator with 3 push-buttons, each monitored by a coloured light - red for instructor, green for technical assistance, and yellow for laboratory supply. When the student presses any of the buttons, a similar light to that on his console also flashes over the corridor entrance to the cubicle. The procedure is duplicated by a flashing light at the place of the responsible faculty member, for example, in the laboratory supply room, in the demonstration room, or in the offices. Light signals are supplemented by sound - a soft gong for the instructor (red signal), a buzzer in the workshop for technical assistance (green signal), and a buzzer for supplies (yellow signal). A call can only be cancelled from its place of orign.

An intercommunication loud speaker-microphone is located next to the annunciator push-buttons. Below the annunciator there is a spring-return intercommunications switch which is normally in the listen position. A call from any one station goes to all others. Normally, students are supplied with background music which is cancelled if a call is made.

Demonstration Theatre (Fig.37b):

The Demonstration Theatre has a double row of stepped seating (capacity 20 students). There is a demonstration area with a bench (physiograph and animal operating table) and a blackboard behind. The lighting and colour in the Theatre is similar to that in the students' laboratories.

The subject to be demonstration is illuminated from above. It is televised by one or two cameras with long or short lenses, depending on the particular event to be televised. The physiograph simultaneously records and relays the experiment to the student stations. Demonstrators wear telephone operator's combined earphone-microphone head gear. A six-channel oscilloscope is situated above the blackboard and it can write the three same channels that the pens are recording, or alternatively, three other channels. Console screens are monitored by two television receivers in the Demonstration Theatre. The Physiology Department has found the two-way communication between cubicles to be very useful during demonstrations as a means of setting the pace of experiments.

Human Studies Room:

Here, students carry out studies involving measurements on humans. The facilities and the bench arrangement in this room are very similar to those in the students' laboratories. Only a single physiograph is fitted, and a couch is provided instead of an animal operating table. Events may also be televised from this room.

BAYLOR CRITIQUE:

Cons:

- The equipment used in the Physiology laboratory is extremely costly, and it is provided for one department only, although, some extension can be made in teaching with the equipment by the use of a master control console.

- It is difficult to visualise such an installation being made in a British medical school unless it could be commonly provided for the use of all departments.

Pros:

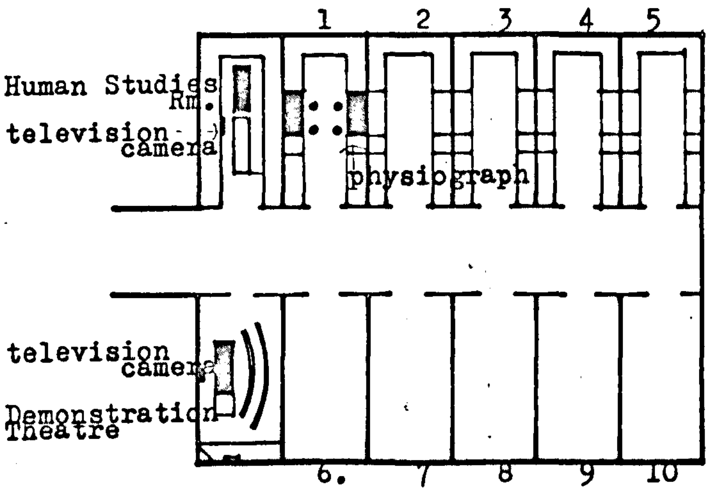
- The Baylor Physiology laboratory is probably the most up to date in the world.

- The laboratory's teaching equipment is made expressly with the student in mind, and it may be used to encompass a very wide range of demonstrations.

- Demonstrations can be seen by all students who become personally involved in the experiments. Other staff and students may also join in with the demonstrations.

- The Baylor example provides an insight into one effective use of instrumentation in medical teaching.

FIGURE 36. BAYLOR UNIVERSITY, HOUSTON, TEXAS:
Physiology teaching laboratory.



- Smoked drum kymograph is replaced by the "physiograph" - an instrument containing pick-up, amplifier, pen and moving paper recording system; one to each pair of students.

- 10 student laboratories each contain physiographs and operating desks.

- The demonstration theatre is equipped with an animal operating table, physiograph, tiered seats and blackboard.

- The human studies room contains a couch and physiograph.

- Television - one screen to each pair of students.

- Intercommunication system - one to each pair of students.

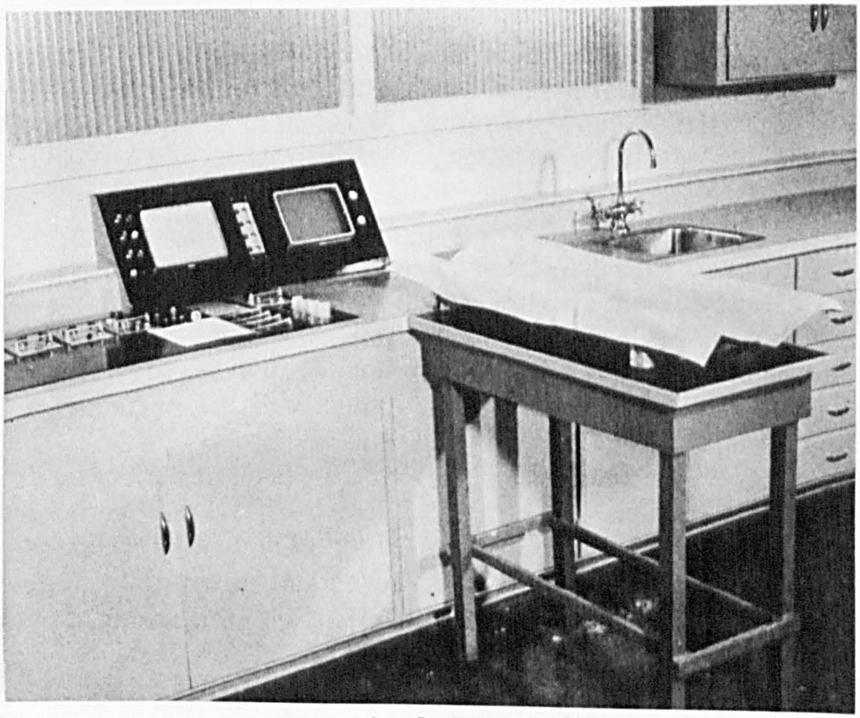


FIGURE 37a: Baylor Medical School Department of Physiology. Student place in the teaching laboratory with 3 channel physiograph and console (annunciator, two-way audio, and T.V. screen). Source: Journal of Medical Education, Reprint, Feb.1959, Vol.34, p.p.110.

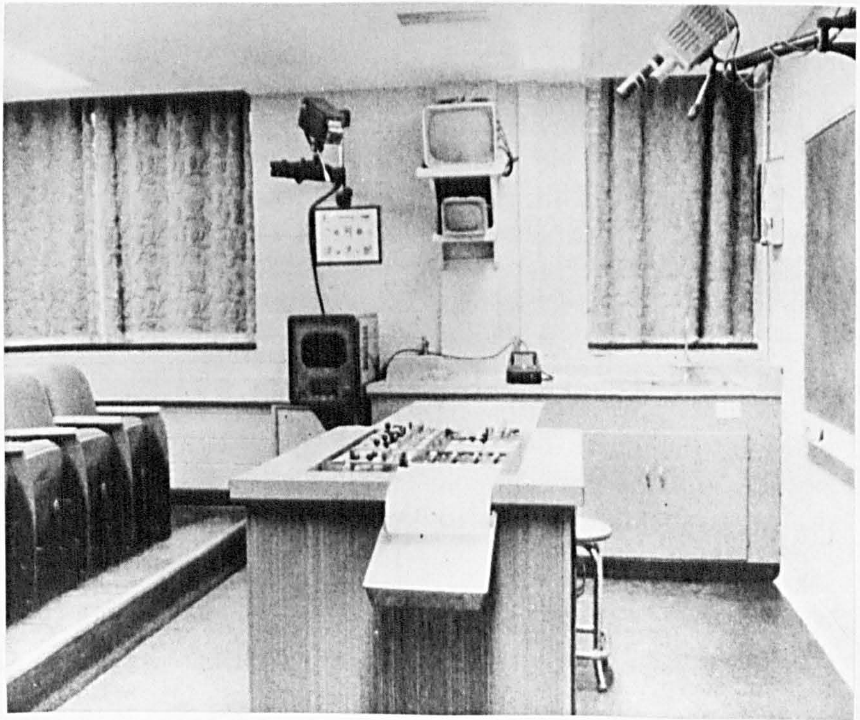


FIGURE 37b: Baylor Medical School Department of Physiology. Demonstration Theatre (in the Physiology laboratory), with demonstration bench (physiograph and animal operating table), 2 T.V. cameras, monitors and stepped seating. Source: ibid.

UNIVERSITY COLLEGE OF RHODESIA AND NYASALAND MEDICAL SCHOOL, SALISBURY

A brief description of this medical school is given, as the author was associated in the preliminary planning stages of the Preclinical school and it is felt that some of the design procedures may be of interest to other medical school planners.

There is no medical school in the Federation of Rhodesia and Nyasaland. To this end, a Planning Committee (centred on the Birmingham medical school) was appointed by the University College of Rhodesia to advise on the desirability of providing a medical school, and, if so, what form the medical school should take. It was agreed that there was such a necessity, and, that the medical school should be built on a site adjacent to the existing Salisbury University, using the Harari African Hospital as its main teaching hospital. Eventually it is proposed to build a teaching hospital (with "Clinical" medical school) next to the Preclinical school.

The Committee's first task was to examine the type and the objectives of the medical course to be provided for the school. A variety of factors had to be taken into account. An important one of these was that "...the pattern of medicine in Africa is determined by environment to a degree unknown in the United Kingdom ..."[1] Of necessity, the medical course should be directed towards local requirements, although, it was based initially on medical teaching attitudes in this country. An integration of the whole medical course was considered to be most desirable, and in conjunction with this proposal, the Committee determined to reduce the factual content of the medical course in order

1. The Central African Journal of Medicine, Supplement to Vol. 5, No. 3, March 1959, p.p. 146.

to provide a curriculum which would be a foundation for the many varieties of medical practice after the medical student had graduated; this was also meant to include medical students who were contemplating a research career. As the medical course diagram shows (Fig. 26b), students are progressively introduced to Clinical medicine from their first year.

ARCHITECTURAL INTERPRETATION (Fig. 38):

The present site for the teaching hospital and medical school was selected in consideration of its easy accessibility to the existing main university complex. In making this selection there was a major design policy that had to be clarified at the outset: should the Preclinical school be located immediately adjacent to the university faculties, or should it be next to the actual "Clinical"medical school which will be housed in the proposed teaching hospital? The latter was selected because it was considered that advantages to be gained in having direct communication between the teaching hospital and the Preclinical school would outweigh those of a direct Preclinical school/ university affiliation. The desirability of providing an integrated curriculum, and the possible benefits to be derived from interrelated Preclinical and "Clinical" research activities were two factors which helped the Planning Committee to decide in favour of a "Full Curriculum" school.

An early architectural problem, and one which is rarely encountered in this country, was that of making provision for a sizable student expansion in the medical school.(1) It was also considered necessary to allow for the development of research areas and there arose a problem of conflicting priorities. The site, although a large one, would not permit the "unlimited" expansion of both teaching and research functions. It was decided that, as teaching expansion was predictable within reasonable limits and that research development was not, the teaching laboratories would have to be sited where their growth was forseen and where their expansion could be attained up to the anticipated maximum number of students. Their size would have to be limited to this student complement. Research areas were planned on an "open-ended" system, generally to the east of the medical school; this also included the animal house (north of the medical school, but not shown on the plan). All research areas were planned on a laboratory module of 11'6"; it was considered to be a suitable unit, which would allow for outwards expansion and internal "decanting".

Because of the necessity to provide for a dual teaching and research growth, it was considered that the medical school should be a single storey complex.

Teaching laboratories had to be planned to facilitate small group and whole class teaching. The research laboratory module, which was also adopted for the teaching laboratories, was found to be a suitable unit for accommodating students in bays of 8. The planned future extensions of the teaching laboratories are mirror images of their initial provisions.

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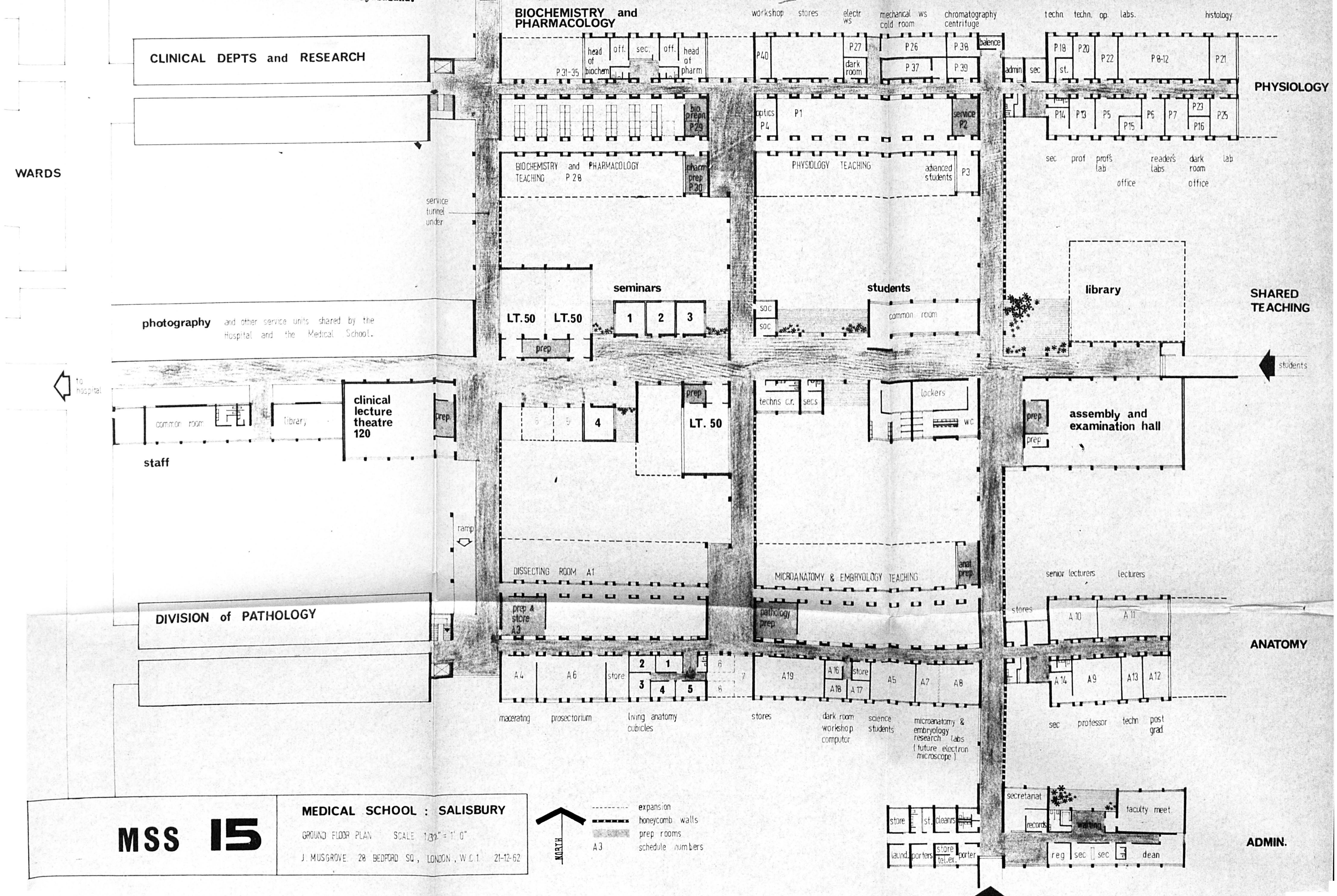
1. The initial student intake was 50 per annum. This will probably be increased to 80 per annum in the future.

   Consultant Architects: Llewelyn-Davies and Weekes.
   John Musgrove.

FIGURE 38: University College Medical School of Rhodesia and Nyasaland.



SUMMARY CONCLUSIONS

The medical schools examined in this chapter all adopt a philosophy which is similar in many respects, although, it does not necessarily obtain in British medical schools.

Before any medical school and teaching hospital planning is begun, objectives of the medical curriculum, and what it is that the medical school is setting out to achieve are determined. In consideration of these factors, programming for staff, students, and their accommodation then follows. The departments and the subjects of the medical course are the primary determinant of the accommodation to be provided in the Basic Science division of the medical school, and to a lesser extent in the Clinical Science division. All schools place some emphasis on an integrated curriculum.

In conjunction with the medical curriculum, the student is provided with a "home base". This may take a number of forms, but, basically there are two schools of thought on such provision:
(1) A unit teaching laboratory (provided on a 24 hour/ 7 day week basis) where the student may perform all "wet" and "dry" procedures.
(2) Two separate areas, one for each of the "wet" and "dry" disciplines.

The medical student is capable of using, and should be introduced to practical teaching equipment which is fitted for its purpose and in respect of the student's requirements after graduation. This equipment can be expensive, but the general concensus of opinion is that it is warranted in the long term interest.

The teaching accommodation of all medical schools makes provision for small group teaching - in groups of from 12 to 20 students.

Schools recognize the present importance of research, and its certain development in the future. All schools provide shared animal facilities.

There does not appear to be agreement on the vertical and horizontal concept for a teaching hospital and medical school. Stanford is a 3 storey compromise which would seem to offer a number of advantages present in both approaches, without too many of the disadvantages.

All schools adopt a policy of traffic segregation for their students, staff, and teaching hospital users.

Modular planning is used, especially in laboratory layouts, but there is not a common agreement on the most suitable module.

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APPENDICES

APPENDIX 1 1947 G.M.C. Recommendations on the Medical Curriculum (summary).

1. RECOMMENDATIONS AS TO GENERAL AND PRE-MEDICAL EDUCATION

Requirements for admission to medical school.

(1) A recognised preliminary examination in General Education.
(2) An examination in the following subjects conducted by the Licensing Body concerned -
   (a) Elementary Physics
   (b) Elementary Chemistry
   (c) Elementary Biology

2. RECOMMENDATIONS AS TO PROFESSIONAL EDUCATION

A. Period of Pre-Clinical Studies

Pre-Clinical studies are not to be less than 5 academic terms. Instruction to be given in Human Anatomy and Human Physiology including histology, human embryology, elementary genetics (as an alternative to being taken with biology), elementary psychology.

There should be close correlation between Anatomy and Physiology.

The period should be used to show normal growth and development.

B. Transitional Period of Study

1. Introductory Clinical Course in the methods of clinical examination extending over a period of three months, introductory to the study of Medicine and of Surgery.

2. Instruction in the elements of Pathology and Bacteriology, and of Pharmacology should be given either in the Pre-Clinical Period, the Introductory Clinical Period, or partly in both.

C. Period of Clinical Studies

It should not be less than 33 months.

1. Medicine: systematic instruction in principles and practice, in the ward and Out Patient Department for 6 months, one month in residence. Systematic instruction in acute infectious diseases, tuberculosis, diseases of the skin, V.D., radiology, dietetics, nursing, physiotherapy.

2. Surgery: systematic instruction in principles and practice as for medicine. Practical instruction in minor operative surgery on the living. Instruction in diseases of the ear, nose, throat, eye, orthopaedics, dental diseases, radiology as applied to surgery, anaesthetics.

Appendix 1 (contd.)

3. Midwifery and Gynaecology: Systematic instruction in principles and practice, including the anatomy, physiology and pathology of pregnancy and labour.
Clinical instruction in midwifery, infant hygiene, gynaecology, and attendance on the practice of a maternity hospital or of the maternity wards of a general hospital and on in-patient and out-patient gynaecological practice for 6 months.

4. Paediatrics: Systematic instruction in principles and practice.
A three month's clerkship - one in residence if possible.
Instruction on the care of the new-born infant and diseases of the neo-natal period.

5. Psychiatry: A course of systematic lectures.
Instruction in a psychiatric O.P.D. on neuroses and psychoneuroses.
Clinical demonstrations in mental hospital and institutions.

6. After-Care and Rehabilitation: Instruction should be given in all courses.

7. Social Medicine and Public Health: Instruction in principles of preventative medicine, including epidemiology, influence of heredity and environment on health and disease, health education, functions of Central and Local Authorities and voluntary organisations.

8. Pathology and Bacteriology: Instruction should be given throughout the Period of Clinical Studies. It should include general and special pathology, clinical and chemical pathology, general and clinical bacteriology, immunology and immunization. Practical instruction in conduct of autopsies; the student should act as a post-mortem clerk in at least ten cases.

9. Pharmacology and Therapeutics: Instruction should be given during the clinical course including practical pharmacy and prescribed therapeutics.

10. Forensic Medicine: Instruction and its practical application in the later stages of the Clinical Period.

11. Legal and Ethical Obligations of Registered Medical Practitioners: Instruction in the later stages of the Clinical period.

APPENDIX 1a. 1957 G.M.C. Recommendations on the Medical Curriculum (summary)

1. RECOMMENDATIONS AS TO GENERAL AND PRE-MEDICAL EDUCATION

Requirements for admission to the medical course: A recognised preliminary examination in General Education. Examinations in theory and practice of physics, chemistry, biology.

2. RECOMMENDATIONS AS TO PROFESSIONAL EDUCATION

Should be not less than 5 academic years.
Inter-departmental teaching should be encouraged throughout.
Critical study is the primary object of the course; factual memorisation and reproduction should not be allowed to interfere with this object.

1. Human Anatomy, Physiology and Biochemistry - including instruction in histology and embryology.
There should be close correlation in the teaching of Anatomy, Physiology and Biochemistry.
Instruction in the elements of normal psychology.

2. Medicine (including Child Health and Paediatrics, Social and Preventative Medicine, and Psychological Medicine) and Surgery.
Systematic instruction in the principles and practice in relation to prevention, diagnosis and treatment of disease.
Clerkships in Medicine, Surgery, and Paediatrics for a period of not less than 15 months in the aggregate; part of the clerkship is recommended in residence.
Students should learn something of the work of the general practitioner. Instruction should be given in the principles of preventative medicine and on the influence of hereditity and environment.

3. Midwifery and Gynaecology: Systematic instruction in the principles and practice. Clinical instruction and attendance at a maternity hospital or maternity wards of a general hospital and on in-patient and out-patient gynaecological practice. The student should spend a minimum of two months residence on midwifery.

4. Pathology: Instruction to be given in association with clinical studies. The student should be able to attend clinico-pathological conferences.

5. Pharmacology: Instruction on practical laboratory work and in the mode of action of drugs, toxic effects, therapeutic uses.

6. Legal and Ethical Obligations of Registered Medical Practitioners and Forensic Medicine.

APPENDIX 2 LICENSING BODIES OF THE G.M.C. Source: Medical Act, 1956.

UNIVERSITIES:

Universities of Oxford; Cambridge; Durham; London;
Victoria University, Manchester;
Universities of Birmingham; Liverpool; Leeds; Sheffield; Bristol; Wales;
St.Andrews; Glasgow;
Aberdeen; Edinburgh;
Queens University, Belfast;
University of Dublin; National University of Ireland;

CORPORATIONS:

Royal College of Physicians of London;
Royal College of Physicians of Edinburgh;
Royal College of Physicians of Ireland;
Royal College of Surgeons of England;
Royal College of Surgeons of Edinburgh;
Royal Faculty of Physicians and Surgeons of Glasgow;
Royal College of Surgeons in Ireland;
Royal College of Obstetricians and Gynaecologists;
Society of Apothecaries of London;
Apothecarie's Hall Dublin.

APPENDIX 3 All staff in British medical schools, 1963 - by division.
Source: Commonwealth Universities Year Book, 1963.

	"Clinical"			Preclinical
	Clinical	Paraclinical	Total	
Birmingham	163	111	274	176
Bristol	139	69	208	122
Newcastle	118	45	163	31
Leeds	85	68	153	40
Liverpool	114	49	163	31
Manchester	157	67	224	46
Sheffield	128	52	180	75
Wales	80	41	121	77
	984	502	1486	598
Aberdeen	123	41	164	10
Edinburgh	186	76	262	82
Glasgow	133	84	217	57
St.Andrews	117	49	166	33
	559	250	809	182
Charing Cross	35	12	47	19
Guy's	45	13	58	18
King's College	50	25	75	-
London	44	11	55	12
Middlesex	39	5	44	19
Royal Free	43	7	50	18
St.Bart's.	36	9	45	14
St.George's	45	17	62	-
St.Mary's	35	13	48	20
St.Thomas's	43	12	55	14
U.C.H.	42	12	54	-
Westminster	34	6	40	-
	491	142	633	134

APPENDIX 4 Numbers of all staff in British medical schools engaged on research, 1951/52 & 1962/63. Source: Scientific Research in British Universities - 1951/52 & 1962/63.

	Clinical		Paraclinical		Preclinical		All	
	51/52	62/63	51/52	62/63	51/52	62/63	51/52	62/63
Birmingham	58	79	35	80	67	128	160	287
Bristol	12	57	19	32	63	89	94	178
Newcastle	44	131	24	31	15	17	83	179
Leeds	37	68	46	47	34	30	117	145
Liverpool	25	83	12	25	16	25	53	133
Manchester	43	100	24	57	18	19	85	176
Sheffield	16	46	31	30	39	59	86	135
Wales	26	32	17	21	46	59	89	112
	261	596	208	323	298	426	767	1345
Aberdeen	16	42	2	17	5	5	23	64
Edinburgh	43	118	20	64	31	41	94	223
Glasgow	53	107	27	43	36	47	116	197
St.Andrews	20	37	14	6	15	8	49	51
	132	304	63	130	87	101	282	535
Charing Cross	0	33	2	10	15	11	17	54
Guy's	36	57	20	32	35	34	91	123
King's College	23	52	16	21	-	-	39	73
London	49	49	20	15	14	18	83	82
Middlesex	17	27	15	21	28	41	60	89
Royal Free	3	64	9	6	26	26	38	96
St.Bart's.	No inf.	98	No inf.	20	No inf.	34	No inf.	152
St.George's	0	39	14	25	-	-	14	64
St.Mary's	25	27	17	32	22	26	64	85
St.Thomas's	7	12	10	11	20	17	37	40
U.C.H.	37	21	25	23	-	-	62	44
Westminster	19	8	8	13	-	-	27	21
	216	487 389+	156	229 209+	160	207 173+	532	923 771+

+ Discounting staff numbers for St.Bart's.

APPENDIX 5 Numbers of medical students in Britain - annual admissions and totals by division. Source: U.G.C. annual Returns for Universities and University Colleges - 1960/61, 1961/62.

	Annual admissns.	Student Totals Male	Female	All	"Clinical"+	Preclin.+
Birmingham	105	340	120	460	246	214
Bristol	90	226	110	336	144	192
Newcastle	92	341	113	454	228	226
Leeds	127	272	132	404	147	257
Liverpool	97	448	152	600	213	387
Manchester	100	328	158	486	219	267
Sheffield	68	206	99	305	129	176
Wales	65	200	99	290	144	155
	744	2361	983	3344	1470	1874
Aberdeen	75	324	117	441	162	279
Edinburgh	137	778	211	989	363	626
Glasgow	168	766	269	1035	381	654
St.Andrews	48	335	119	454	159	295
	428	2203	716	2919	1065	1854
Charing Cross	44	190	44	234	123	111
Guy's	104	499	87	586	216	370
King's College	44	154	30	184	184	-
London	92	365	75	440	144	296
Middlesex	81	346	75	421	153	268
Royal Free	84	59	356	415	156	259
St.Bart's.	114	463	114	577	198	379
St.George's	48	108	20	128	123	-
St.Mary's	97	339	97	436	192	244
St.Thomas's	89	333	59	392	117	275
U.C.H.	75	209	45	254	254	-
Westminster	41	164	31	195	195	-
	913	3229	1033	4262	2060	2202

+ These figures can only be taken as being approximate

APPENDIX 6 U.G.C. SUGGESTED SCALES OF ACCOMMODATION
Source: U.G.C. Notes of Procedure for Non-Recurrent Grants; Section C - Annex, p.p. 12. H.M.S.O. 1963.

		Usable Area.
Academic Staff (exclusive of any private laboratory):		
	Professor or Head of Department	200 sq.ft.
	Reader or Senior Lecturer	150 sq.ft.
	Other teaching staff	100 sq.ft.
Secretarial and Clerical Staff:		(per person)
	(Minimum room size 75 sq.ft.)	60 sq.ft.
Lecture Theatres:		
	With demonstration bench and close or tiered seating:	
	(a) for first 30 students (or part)	15 sq.ft.
	(b) for next 20 students (or part)	12 sq.ft.
	(c) for remainder	10 sq.ft.
Seminar Rooms		20 sq.ft.
Drawing Offices		
	Advanced engineering, architecture or subjects where drawing is the major element in practical work and demands double elephant boards or larger	50 sq.ft.
	Using imperial boards	30 sq.ft.
	Using ½ - imperial boards	20 sq.ft.
Laboratories (Science)		(per work place)
	(including fume cupboards but excluding balance rooms, store rooms and preparation rooms)	
	Elementary or Intermediate	40 sq.ft.
	First & Second Year Honours and General	45 sq.ft.
	Final Year Honours	60 sq.ft.
	Research students in groups of 4 or more	80 sq.ft.
	Advanced or individual research	120 sq.ft.

Appendix 6 (contd.) U.G.C. Suggested Scales of Accommodation.

Accommodation ancillary to laboratories

Laboratories, whether used for teaching or research, require supplementation by other rooms such as stores and preparation rooms, glass-blowing workshops, instrument workshops, dark rooms, cold stores, constant temperature rooms, furnace rooms and so forth. All these form part of the usable area. The space required for these purposes will vary, but for general guidance it is suggested that (except where specially large workshops are needed) the following limits should normally suffice:

(a) Stores and preparation rooms only	15% of lab. area
(b) Other teaching or research ancillaries	20% of lab. area

These percentages refer to usable area only and exclude those stores and maintenance rooms which are appropriately included in the balance.

Cepartmental Libraries

Reading space	25 sq.ft. per work place
Open access bookshelf area, including gangways	60 sq.ft. per 1000 books (assumes 7 shelves high)
Closed access bookshelf area, including gangways	35 sq.ft. per 1000 books (assumes 7 shelves high)

Percentage Additions (p.p. 15)

The percentages normally added to the usable area in order to arrive at the assumed gross area are at present as follows:

Pure Science Buildings	60%
Other teaching and research buildings	55%
Unions and refectories	50%
Libraries	40%

APPENDIX 7 ROYAL INFIRMARY, EDINBURGH

a. CLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshp.	Stores	Miscl.	Teach.		
Dermatology	T.								300	300	
	R.	1100	900	-	500	200	250	-	-	2950	3250
Medicine	T.								600	600	
	R.	7500	5700	400	2250	750	1300	2725	-	20625	21225
Psych. Medicine	T.								380	380	
	R.	570	560	400	305	150	136	250	-	2371	2751
Respiratory Diseases	T.								500	500	
	R.	2150	1925	-	150	225	525	365	-	5340	5840
Therapeutics	R.	4400	3200	300	550	300	950	1975	-	11675	11675
Anaesthetics	T.								840	840	
	R.	3525	1500	-	-	300	300	550	-	6175	7015
Obstet. & Gynaecology	R.	3775	2900	-	425	250	870	1325	-	9545	9545
Orthopaedics	T.								900	900	
	R.	3720	1550	-	1300	250	500	730	-	8050	8950
Oto-laryngology	R.	1200	1700	-	200	360	550	300	-	4310	4310
Radiotherapy	R.	1125	-	-	-	-	800	400	-	2325	2325
Surgery (Clinical)	T.								600	600	
	R.	5720	4900	-	650	200	500	1625	-	13595	14195
Surgery (Non-clinical)	R.	1050	5000	200	450	-	650	525	-	7875	7875
Neurology	R.	1925	600	-	-	-	150	1900	-	4575	4575
		37760	30435	1300	6780	2985	7481	12670	4120		103531

Source: Schedules of Accommodation for the University of Edinburgh Faculty of Medicine, 31st. January, 1963.

All areas in sq.ft., net. - circulation is excluded.

APPENDIX 7 ROYAL INFIRMARY, EDINBURGH

b. PARACLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. Labs.	Wkshps	Stores	Miscl.	Teach.		
Bacteriology	T.								9000	9000	
	R.	2375	4250	1250	650	500	-	575	-	9600	
	S.	3350	11950	2800	400	-	1700	1900	-	22100	40700
Clinical Chemistry	T.								4500	4500	
	R.	900	4500	-	900	300	300	775	-	7675	
	S.	650	4450	300	525	-	750	450	-	7125	19300
Medical Physics	T.								3150	3150	
	R.	2695	3260	-	400	-	-	1390	-	7745	
	S.	520	6550	270	150	2000	640	800	-	10930	21825
Pathology	T.								5100	5100	
	R.	400	6000	1550	1800	750	500	1450	-	12450	
	S.	775	4900	1300	650	200	13400	300	-	21525	39075
Radio-diagnosos	T.								3595	3595	
	R.	-	2500	200	-	-	-	650	-	3350	
	S.	160	1325	-	-	-	-	750	-	2235	9180
Public Health & Social Medicine	T.								2500	2500	
	R.	-	1950	-	-	-	550	-	-	2500	
	S.	4825	2200	-	-	-	350	700	-	8075	13075
		16650	53835	7670	5475	3750	18190	9740	27845		143155

Source: Schedules of Accommodation for the University of Edinburgh Faculty of Medicine, 31st January, 1963.

All areas in sq.ft., net - circulation is excluded.

Departments of Clinical Endocrinology (20190 sq.ft.) and Clinical Genetics (2875 sq.ft.) - area breakdowns not to hand

APPENDIX 7 ROYAL INFIRMARY, EDINBURGH

c. CENTRAL & SHARED FACILITIES

CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	1525								1525
Animal House		25000							25000
Ameneties							20000		20000
Illustration							5700		5700
Isotope Suite		3960							3960
Workshops					4000				4000
Stores						3000			3000
Demonstration Area								6350	6350
Lecture Theatres								17930	17930
Seminar & Tutorial Rooms								4600	4600
Student Clinical Laboratory								8100	8100
	1525	28960	-	-	4000	3000	25700	36980	100165

d. AREA SUMMARY

CLINICAL	37760	30435	1300	6780	2985	7481	12670	4120	103531
PARACLINICAL	16650	53835	7670	5475	3750	18190	9740	27845	143155
CENTRAL	1525	28960	-	-	4000	3000	25700	36980	100165
	55935	113230	8970	12255	10735	28671	48110	68945	346851

Source: Schedules of Accommodation for the University of Edinburgh Faculty of Medicine, 31st. January, 1963.

All areas in sq.ft. - circulation is excluded.

APPENDIX 8 WELSH NATIONAL SCHOOL OF MEDICINE, CARDIFF

a. CLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Medicine	T.								766	766	
	R.	1395	2790	120	662	196	472	-	-	5635	6401
Mental Health	T.								250	250	
	R.	770	500	-	-	-	150	-	-	1420	1670
Surgery	T.								766	766	
	R.	1595	1300	120	120	250	472	-	-	3857	4623
Obstetrics & Gynaecology	T.								1016	1016	
	R.	1545	1500	120	120	250	472	-	-	4007	5023
Paediatrics	T.								550	550	
	R.	1345	1100	240	-	120	280	-	-	3085	3635
Anaesthetics	T.								300	300	
	R.	1345	800	-	120	300	472	-	-	3037	3337
Radio-therapy	R.	370	400	-	-	-	-	-	-	770	770
		8365	8390	600	1022	1116	2318	-	3648		25459

Source: Architectural Competition, 8th April, 1959, Conditions and Instructions to Competing Architects and Schedules of Accommodation.

All areas in sq.ft., net - circulation excluded.

APPENDIX 8 WELSH NATIONAL SCHOOL OF MEDICINE, CARDIFF

b. PARACLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Pathology Main Dept.	T.								6400	6400	
	R.	640	-	-	680	1000	500	430	-	3250	
	S.	-	1500	800	-	-	1000	1340	-	4640	
Sub.Depts. Bacteriology	T.								400	400	
	R.	2220	1425	-	-	-	320	350	-	4315	
	S.	400	500	1000	550	-	-	90	-	2540	
Pathology	R.	2150	1185	-	-	-	826	374	-	4535	
Clinical Chemistry	R.	2200	1630	-	-	-	320	350	-	4500	
Clinical Pathology	R.	2200	350	-	-	-	-	350	-	2900	
	T.								6800	6800	
	R.	9410	4590	-	680	1000	1966	1854	-	19500	
	S.	625	3225	2050	550	-	1000	1430	-	8880	35180
Public Health	S.	600	6250	1000	-	-	600	1050	-		9500
Industrial Health	T.								250	250	
	R.	920	500	-	-	-	346	-	-	1766	2016
Preventive Medicine	T.								1400	1400	
	R.	1100	-	-	120	-	196	-	-	1416	
	S.	1500	-	-	-	-	430	600	-	2530	5346
Pharmacology & Materia-Medica	T.								3970	3970	
	R.	1570	2700	400	520	400	672	200	-	6462	10432
Hospital Physics	R.	970	1250	-	120	150	380	-	-		2870
		16695	18515	3450	1990	1550	5590	5134	12420		65344

Source: Architectural Competition, 8th April, 1959, Conditions and Instructions to Competing Architects and Schedules of Accommodation.

All areas in sq.ft., net - circulation excluded.

APPENDIX 8 WELSH NATIONAL SCHOOL OF MEDICINE, CARDIFF

c. CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	5700								5700
Animal House		4400							4400
Photography & Medical Art							1906		1906
Workshops					2200				2200
Locker & Common Rooms							2510		2510
Lecture Hall								2600	2600
Library								6538	6538
Museum								2400	2400
	5700	4400	-	-	2200	-	4416	11538	28254

d. AREA SUMMARY									
CLINICAL	8365	8390	600	1022	1116	2318	-	3648	25459
PARACLINICAL	16695	18515	3450	1990	1550	5590	5134	12420	65344
CENTRAL	5700	4400	-	-	2200	-	4416	11538	28254
	30760	31305	4050	3012	4866	7908	9550	27606	119057

Source: Architectural Competition, 8th April, 1959, Conditions and Instruction to Competing Architects and Schedules of Accommodation.

All areas in sq.ft., net - circulation excluded

APPENDIX 9 UNIVERSITY OF SHEFFIELD MEDICAL SCHOOL

a. CLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Medicine (main dept.)	T.								300	300	
	R.	1250	2200	280	520	280	150	350	-	5030	
Dermatology	R.	200	300							500	
Neurology	R.	200	300							500	
Cardiology	R.	200	300							500	
Other Specialties	R.	200	300							500	
		2050	3400	280	520	280	150	350	300	7330	7330
Surgery (main dept.)	T.								260	260	
	R.	1280	2050	80	200	120	150	770	-	4650	
Anaesthetics	R.	370	540							910	
Facilities for p. clin. staff	R.	240	360							600	
Neurosurgery	R.	220	360					200		780	
Opthalmology	R.	220	360					200		780	
Orthopaedics	R.	220	360					200		780	
Oto-rhino-laryngology	R.	220	360					200		780	
Urology	R.	220	360					200		780	
		2990	4750	80	200	120	150	1770	260	10320	10320
Therapeutics	T.								250	250	
	R.	840	2520	80	320	120	120	470	-	4470	4720
Psychiatry	R.	800	600							1400	1400
		6680	11270	440	1040	520	420	2590	810		23770

Source: Schedules of Accommodation for New Teaching Hospital and Clinical Medical School, Glossop Road, Sheffield 10. Revised edition, September 1961.

All areas in sq.ft., net - circulation excluded

APPENDIX 9 UNIVERSITY OF SHEFFIELD MEDICAL SCHOOL

b. PARACLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Pathology (general & special)	T.								5150	5150	
	R.	1785	3365	400	500	-	300	100	-	6450	
Post Mortem Suites	S.	120	1410	600	-	-	650	920	-	3700	
Morbid.Anat.	S.	1200	-	950	100	-	750	-	-	3000	
Neuropath.	T.								250	250	
	S.	425	-	475	-	-	200	-	-	1100	
Haematology	T.								250	250	
	S.	625	2425	200	150	-	200	400	-	4000	
		4155	7200	2625	750	-	2100	1420	5650		23900
Bacteriology	T.								2950	2950	
	R.	650	3000	1850	600	-	700	150	-	6950	
	S.	575	2575	150	100	-	-	-	-	3400	
		1225	5575	2000	700	-	700	150	2950		13300
Chemical Pathology	T.								2480	2480	
	R.	800	2150	600	300	-	300	400	-	4550	
	S.	650	2550	-	325	-	275	200	-	4000	
		1450	4700	600	625	-	575	600	2480		11030
Preventive Medicine & Public Health	T.								1000	1000	
	R.	2290	500	-	-	-	-	-	-	2790	3790
Radiation Med. & Medical Physics	R.	450	1200	-	90	450	210	270	330		3000
Radiology	R.	520	500	-	-	-	-	600	-		1620
		10090	19675	5225	2165	450	3585	3040	12410		56640

Source: Schedules of Accommodation for New Teaching Hospital and Clinical Medical School, Glossop Road, Sheffield 10. Revised edition, September 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 9 UNIVERSITY OF SHEFFIELD MEDICAL SCHOOL

c. CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	3230								3230
Animal House		7000							7000
Ameneties							2220		2220
Research labs. for Clin. staff		3000							3000
Physicists Lab.		1000							1000
Medical Illustration (inc. Med. Artist)							2615		2615
General Workshops					4000				4000
Inflammable Store						400			400
Lecture Theatres								6530	6530
Library								7000	7000
Museum								2200	2200
	3230	11000	-	-	4000	400	4835	15730	39195

d. AREA SUMMARY

CLINICAL	6680	11270	440	1040	520	420	2590	810	23770
PARACLINICAL	10090	19675	5225	2165	450	3585	3040	12410	56640
CENTRAL	3230	11000	-	-	4000	400	4835	15730	39195
	20000	41945	5665	3205	4970	4405	10465	28950	119605

Source: Schedules of Accommodation for New Teaching Hospital and Clinical Medical School, Glossop Road, Sheffield 10. Revised edition, September 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 10 UNIVERSITY OF ST.ANDREWS MEDICAL SCHOOL, NINEWELLS, DUNDEE

a. CLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Medicine	T.								286	286	
	R.	1334	3180	-	771	190	481	-	-	5956	6242
Therapeutics	T.								286	286	
	R.	333	3297	286	628	312	581	-	-	5437	5723
Psychiatry	T.								286	286	
	R.	1152	2431	-	104	-	581	-	-	4268	4554
Surgery	T.								286	286	
	R.	1191	2431	429	490	286	481	-	-	5308	5594
Midwifery & Gynaecology	T.								286	286	
	R.	1571	2574	143	95	286	481	286	-	5436	5722
Paediatrics	T.								286	286	
	R.	619	2385	286	494	286	582	143	-	4795	5081
		6200	16298	1144	2582	1360	3187	429	1716		32916

b. PARACLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Bacteriology	T.								2100	2100	
	R.	333	2810	-	199	-	95	-	-	3437	
	S.	286	3428	1239	381	-	945	675	-	6954	12491
Pathology	T.								4100	4100	
	R.	333	4240	-	286	-	100	-	-	4959	
	S.	476	4286	-	95	-	1340	190	-	6387	15446
Pharmacology	T.								3500	3500	
	R.	619	5337	-	490	286	485	572	-	7789	11289
Clinical Chemistry	T.								3500	3500	
	R.	809	4763	-	1160	286	104	-	-	7122	
	S.	666	3526	286	969	-	619	-	-	6064	16686
Public Health & Social Med.	T.								716	716	
	R.	2885	910	-	-	-	286	-	-	4081	4797
Forensic Medicine	T.								430	430	
	R.	476	215	-	-	-	121	-	-	812	1242
		6883	29515	1525	3578	572	4095	1437	14346		61951

Source: Schedules of Accommodation, Second Edition, April 1961.
All areas in sq.ft., net - circulation excluded.

APPENDIX 10 UNIVERSITY OF ST.ANDREWS MEDICAL SCHOOL, NINEWELLS, DUNDEE

c. CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	2140								2140
Animal House		18880							18880
Ameneties							14710		14710
Photography							1756		1756
Medical Art & Illustration							1000		1000
Demonstration Rooms								6400	6400
Lecture Theatres								7600	7600
Museum								2500	2500
Library								13500+	13500
	2140	18880	-	-	-	-	17466	30000	68486

d. AREA SUMMARY									
CLINICAL	6200	16298	1144	2582	1360	3187	429	1716	32916
PARACLINICAL	6883	29515	1525	3578	572	4095	1437	14346	61951
CENTRAL	2140	18880	-	-	-	-	17466	30000	68486
	15223	64693	2669	6160	1932	7282	19332	46062	163353

Source: Schedules of Accommodation, Second Edition, April 1961.

All areas in sq.ft., net - circulation excluded.

+ This does not take account of a 2 storey book stack area of approx. 2100sq.f

APPENDIX 11 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE

a. CLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs	Wkshps	Stores	Miscl.	Teach.		
Medicine	T.								500	500	
	R.	2550	3650	150	450	350	500	600	-	8250	8750
Dermatology	T.								400	400	
	R.	1300	1950	150	-	300	300	500	-	4500	4900
Psych-ological Medicine	T.								600	600	
	R.	2450	2650	-	330	250	350	600	-	6630	7230
Surgery	T.								500	500	
	R.	2400	3750	-	950	400	400	600	-	8500	9000
Anaesthetics	T.								400	400	
	R.	900	1450	-	150	250	300	300	-	3350	3750
Midwifery & Gynaecology	T.								500	500	
	R.	1200	2450	-	100	-	550	650	-	4950	5450
Paediatrics	T.								700	700	
	R.	1775	2050	200	300	-	700	550	-	5575	6275
Speech Pathology	T.								800	800	
	R.	800	400	-	-	-	200	150	-	1550	2350
		13375	18350	500	2280	1550	3300	3950	4400		47705

Source: Schedules of Accommodation, April 1962.

All areas in sq.ft., net - circulation excluded.

APPENDIX 11 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE

b. PARACLINICAL DEPARTMENTS

		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Bacteriology	T.								9925	9925	
	R.	2400	3300	1000	1675	275	450	750	-	9850	
	S.	750	4350	1200	475	275	1100	1200	-	9350	29125
Industrial Health	T.								400	400	
	R.	2288	3490	-	250	-	363	500	-	6891	
	S.	388	-	150	-	-	283	-	-	821	8112
Public Health	T.								500	500	
	R.	1350	400	-	-	-	200	700	-	2650	3150
Medical Physics	T.								600	600	
	R.	1120	2750	-	250	1400	920	650	-	7090	7690
Demyelinating Disease Research	R.	250	1700	-	800	-	75	400	-	3225	
	S.	-	150	-	-	-	-	-	-	150	3375
Clinical Chemistry	T.								1050	1050	
	R.	625	3040	100	700	125	275	400	-	5265	
	S.	275	2300	100	600	125	475	600	-	4475	10790
		9446	21480	2550	4750	2200	4141	5200	12475		62242

c. "PRECLINICAL" DEPARTMENTS

		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Anatomy	T.								15360	15360	
	R.	2350	3150	900	1050	-	400	700	-	8550	
	S.	-	50	-	-	-	100	-	-	150	24060
Physiology	T.								12120	12120	
	R.	2850	4900	-	1600	-	-	750	-	10100	
	S.	100	-	1150	400	800	1180	300	-	3930	26150
Pharmacology	T.								1700	1700	
	R.	1500	2700	-	300	-	-	400	-	4900	
	S.	100	-	-	200	400	500	200	-	1400	8000
		6900	10800	2050	3550	1200	2180	2350	29180		58210

Source: Schedules of Accommodation, April 1962.

All areas in sq.ft., net - circulation excluded.

APPENDIX 11 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE

d. CENTRAL & SHARED FACILITIES

CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	6050								6050
Animal House		23020							23020
Ameneties							8950		8950
Television Services							1450		1450
General Maintenance							5970		5970
Examination Hall								3500	3500
Lecture Theatres								9970	9970
Seminar Rooms								3200	3200
Library								15450	15450
Museum								2800	2800
Multi-discipline Laboratories								27140	27140
Photography							6470		6470
	6050	23020	-	-	-	-	22820	62060	113950

e. AREA SUMMARY

CLINICAL	13375	18350	500	2280	1550	3300	3950	4400	47705
PARACLINICAL	9446	21480	2550	4750	2200	4141	5200	12475	62242
"PRECLINICAL"	6900	10800	2050	3550	1200	2180	2350	29180	58210
CENTRAL	6050	23020	-	-	-	-	22820	62060	113950
	35771	73650	5100	10580	4950	9621	34320	108115	282107

Source: Schedules of Accommodation, April 1962.

All areas in sq.ft., net - circulation excluded.

Dental school is excluded.

APPENDIX 12 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE - hypothetical medical school types 1 & 2

a. CLINICAL DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Medicine											
Medicine	T.								350	350	
	R.	970	1830	-	-	-	-	-	-	2800	
Cardio-vascular-renal	R.	560	610	-	-	-	-	-	-	1170	
Gastro-intestinal	R.	560	610	-	-	-	-	-	-	1170	
Neurology	R.	560	610	-	-	-	-	-	-	1170	
Chest	R.	420	610	-	-	-	-	-	-	1030	
Metabolism	R.	280	410	-	-	-	-	-	-	690	
Allergy	R.	280	410	-	-	-	-	-	-	690	
Dermat-ology	R.	420	610	-	-	-	-	-	-	1030	
Haemat-ology	R.	140	200	-	-	-	-	-	-	340	
Common use Facilities	T.								350	350	
	R.	610	1830	280	670	-	280	-	-	3670	
	T.								700	700	
	R.	4800	7730	280	670	-	280	-	-	13760	14460
Surgery											
Surgery	T.								350	350	
	R.	1510	2440	-	-	-	-	-	-	3950	
Ortho-paedics	R.	280	410	-	-	-	-	-	-	690	
Urology	R.	420	410	-	-	-	-	-	-	830	
Eye, ear, nose & throat	R.	420	810	-	-	-	-	-	-	1230	
Anaesth-esiology	R.	280	410	-	-	-	-	-	-	690	
Neuro-surgery	R.	280	410	-	-	-	-	-	-	690	
Common use Facilities	T.								700	700	
	R.	210	1020	280	200	-	280	-	-	1990	
	T.								1050	1050	
	R.	3400	5910	280	200	-	280	-	-	10070	11120

Source: U.S. Department of Health, Education, and Welfare - "Medical School Facilities, planning considerations and architectural guide" Publication No. 875, 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 12 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE - hypothetical medical school types 1 & 2

a. Clinical depts. contd.		Offices	Labs.	Suppl lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Paediatrics	T.								350	350	
	R.	1250	2040	140	200	-	140	-	-	3370	4120
Obstetrics & Gynaecology	T.								350	350	
	R.	970	1910	280	200	-	410	-	-	3770	4120
Psychiatry	T.								350	350	
	R.	2290	3460	140	-	-	280	-	-	6170	6520
Radiology	T.								350	350	
	R.	970	2040	280	200	-	280	-	-	3770	4120
Preventive Medicine	T.								350	350	
	R.	970	2040	280	200	-	280	-	-	3770	4120
Shared Clinical Facilities	T.								2760	2760	
	R.							1200		1200	3960
		14650	25130	1680	1670	-	1950	1200	6260		52540

Source: U.S. Department of Health, Education, and Welfare - "Medical School Facilities, planning considerations and architectural guide". Publication No. 875, 1961.

All areas in sq.ft., net - circulation excluded

APPENDIX 12 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE - hypothetical medical school type 1

b. BASIC SCIENCE DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Anatomy	T.								12760	12760	
	R.	1250	4670	280	-	-	280	-	-	6480	
	S.	140	560	-	410	-	1510	200	-	2820	22060
Biochemistry	T.								6370	6370	
	R.	1310	3850	280	910	280	280	-	-	6910	13280
Physiology	T.								5960	5960	
	R.	1250	3310	280	950	280	1240	-	-	7310	13270
Microbiology	T.								5390	5390	
	R.	970	4260	1490	200	-	970	-	-	7890	13280
Pathology	T.								6490	6490	
	R.	1390	3990	280	-	-	280	310	-	6250	
	S.	140	820	1590	820	-	410	-	-	3780	16520
Pharmacology	T.								6310	6310	
	R.	1250	3050	840	310	-	800	-	-	6250	12560
		7700	24510	5040	3600	560	5770	510	43280		90970

c. CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	5120								5120
Animal Quarters		14860							14860
Ameneties							2800		2800
Electron-microscope Suite		610							610
Radioisotope Laboratory		450							450
Medical Illustration							3170		3170
General Maintenance							15330		15330
Technical Shops					2000				2000
Conference Room								1080	1080
Lecture Rooms								3780	3780
Library								23350	23350
Study Cubicles								9400	9400
	5120	15920	-	-	2000	-	21300	37610	81950

Source: U.S. Department of Health, Education, and Welfare - "Medical School Facilities, planning considerations and architectural guide". Publication No. 875, 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 12 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
hypothetical medical school type 2 (with multidiscipline teaching laboratories)

d. BASIC SCIENCE DEPARTMENTS		Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.		
Anatomy	T.								8880	8880	
	R.	1250	4670	280	-	-	280	-	-	6480	
	S.	140	560	-	410	-	1510	200	-	2820	18180
Biochemistry	T.								2270	2270	
	R.	1310	3850	280	910	280	280	-	-	6910	9180
Physiology	T.								1860	1860	
	R.	1250	3310	280	950	280	1240	-	-	7310	9170
Microbiology	T.								1290	1290	
	R.	970	4260	1490	200	-	970	-	-	7890	9180
Pathology	T.								2390	2390	
	R.	1390	3990	280	-	-	280	310	-	6250	
	S.	140	820	1590	320	-	410	-	-	3780	12420
Pharmacology	T.								2110	2110	
	R.	1250	3050	840	310	-	800	-	-	6250	8360
		7700	24510	5040	3500	560	5770	510	18800		66490

e. CENTRAL & SHARED FACILITIES	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
Administration	5120								5120
Animal Quarters		14860							14860
Ameneties							2800		2800
Electron-microscope Suite		610							610
Radioisotope Laboratory		450							450
Medical Illustration							3170		3170
General Maintenance							15330		15330
Technical Shops					2000				2000
Conference Room								1080	1080
Lecture Rooms								3780	3780
Library								23350	23350
Study Cubicles								9400	9400
Multi-discipline Laboratories								16190	16190
	5120	15920	-	-	2000	-	21300	53800	98140

Source: U.S. Department of Health, Education, and Welfare - "Medical School Facilities, planning considerations and architectural guide". Publication No. 875, 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 12 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
hypothetical medical school types 1 & 2

AREA SUMMARY	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
f. School type 1.									
CLINICAL	14650	25130	1680	1670	-	1950	1200	6260	52540
BASIC SCIENCE	7700	24510	5040	3600	560	5770	510	43280	90970
CENTRAL	5120	15920	-	-	2000	-	21300	37610	81950
	27470	65560	6720	5270	2560	7720	23010	87150	225460
g. School type 2.									
CLINICAL	14650	25130	1680	1670	-	1950	1200	6260	52540
BASIC SCIENCE	7700	24510	5040	3600	560	5770	510	18800	66490
CENTRAL	5120	15920	-	-	2000	-	21300	53800	98140
	27470	65560	6720	5270	2560	7720	23010	78860	217170

Source: U.S. Department of Health, Education, and Welfare -
"Medical School Facilities, planning considerations and architectural guide".
Publication No. 875, 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 13 ROYAL INFIRMARY, EDINBURGH

DEPARTMENTAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. CLINICAL DEPARTMENTS									
Dermatology	33.8	27.7	-	15.4	6.2	7.7	-	9.2	100
			43.1						
Medicine	35.3	26.9	1.9	10.6	3.5	6.1	12.9	2.8	100
			39.4						
Psychological Medicine	20.6	20.4	14.5	11.2	5.5	4.9	9.1	13.8	100
			46.1						
Respiratory Diseases	36.8	33.9	-	2.6	3.8	9.0	6.3	8.6	100
			36.5						
Therapeutics	37.7	27.4	2.6	4.7	2.6	8.1	16.9	-	100
			34.7						
Anaesthetics	50.3	21.4	-	-	4.2	4.2	7.9	12.0	100
Obstetrics & Gynaecology	39.6	30.2	-	4.5	2.6	9.2	13.9	-	100
			34.7						
Orthopaedics	41.6	17.3	-	14.5	2.8	5.6	8.2	10.0	100
			31.8						
Otolaryngology	27.9	39.5	-	4.6	8.3	12.8	6.9	-	100
			44.1						
Radiotherapy	48.4	-	-	-	-	34.4	17.2	-	100
Surgery (Clinical)	40.3	34.6	-	4.5	1.4	3.5	11.5	4.2	100
			39.1						
Surgery (Non-clinical)	13.3	63.5	2.5	5.7	-	8.3	6.7	-	100
			71.7						
Neurology	42.1	13.1	-	-	-	3.2	41.6	-	100
	36.4%	29.4%	1.3%	6.6%	2.9%	7.2%	12.2%	4.0%	100%
			37.3%						
b. PARACLINICAL DEPARTMENTS									
Bacteriology	14.1	39.8	9.0	2.6	1.2	4.2	6.1	22.1	100
			52.3						
Clinical Chemistry	8.0	46.4	1.5	7.5	1.5	5.4	6.4	23.3	100
			55.4						
Medical Physics	14.7	45.0	1.3	2.5	9.2	2.9	10.0	14.4	100
			48.8						
Pathology	2.9	27.9	7.3	6.3	2.4	35.6	4.5	13.1	100
			41.5						
Radiodiagnosis	1.7	41.6	2.2	-	-	-	15.3	39.2	100
			43.8						
Public Health & Social Med.	36.9	31.8	-	-	-	6.8	5.4	19.1	100
	11.6%	37.6%	5.4%	3.8%	2.6%	12.7%	6.8%	19.5%	100%
			46.8%						

Source: Appendix 7

APPENDIX 13 ROYAL INFIRMARY, EDINBURGH

CATEGORY APPORTIONMENT	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
c. CLINICAL DEPARTMENTS									
Dermatology	2.9	3.0	-	7.4	6.7	3.3	-	7.3	3.2%
Medicine	19.9	18.7	30.8	33.2	25.1	17.4	21.5	14.6	20.6%
Psychological Medicine	1.5	1.9	30.8	4.5	5.0	1.8	2.0	9.2	2.7%
Respiratory Diseases	5.7	6.3	-	2.2	7.5	7.0	2.9	12.1	5.2%
Therapeutics	11.7	10.5	23.0	8.1	10.1	12.7	15.6	-	11.3%
Anaesthetics	9.3	4.9	-	-	10.1	4.0	4.3	20.4	6.8%
Obstetrics & Gynaecology	10.0	9.5	-	6.3	8.4	11.6	10.5	-	9.2%
Orthopaedics	9.8	5.1	-	19.2	8.4	6.7	5.8	21.8	8.7%
Otolaryngology	3.2	5.6	-	2.9	12.0	7.4	2.3	-	4.2%
Radiotherapy	3.0	-	-	-	-	10.7	3.2	-	2.3%
Surgery (Clinical)	15.1	16.1	-	9.6	6.7	6.7	12.8	14.6	13.7%
Surgery (Non-clinical)	2.8	16.4	15.4	6.6	-	8.7	4.1	-	7.6%
Neurology	5.1	2.0	-	-	-	2.0	15.0	-	4.5
	100	100	100	100	100	100	100	100	100.0%
d. PARACLINICAL DEPARTMENTS									
Bacteriology	34.4	30.1	52.8	19.2	13.4	9.4	25.4	32.3	28.4%
Clinical Chemistry	9.3	16.6	3.9	26.0	8.0	5.8	12.6	16.2	13.5%
Medical Physics	19.3	18.2	3.5	10.1	53.4	3.5	22.5	11.3	15.3%
Pathology	7.1	20.3	37.2	44.9	25.3	76.4	17.9	18.3	27.3%
Radiodiagnosis	0.9	7.1	2.6	-	-	-	14.4	12.9	6.4%
Public Health & Social Med.	29.0	7.7	-	-	-	4.9	7.2	9.0	9.1%
	100	100	100	100	100	100	100	100	100.0%

Source: Appendix 7

APPENDIX 14 WELSH NATIONAL SCHOOL OF MEDICINE, CARDIFF

DEPARTMENTAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. CLINICAL DEPARTMENTS									
Medicine	21.8	43.6	1.9	10.3	3.0	7.4	-	12.0	100
			55.8						
Mental Health	46.0	30.0	-	-	-	9.0	-	15.0	100
Surgery	34.5	28.1	2.6	2.6	5.4	16.6	-	10.2	100
			33.3						
Obstetrics & Gynaecology	30.8	29.8	2.4	2.4	5.0	9.4	-	20.2	100
			34.6						
Paediatrics	37.0	30.3	6.6	-	3.3	7.7	-	15.1	100
			36.9						
Anaesthetics	39.9	24.7	-	3.6	8.9	14.0	-	8.9	100
			28.3						
Radiotherapy	48.1	51.9	-	-	-	-	-	-	100
	32.8%	33.0%	2.4%	4.0%	4.4%	9.1%	-	14.3%	100%
			39.4%						
b. PARACLINICAL DEPARTMENTS									
Pathology									
Main Dept.	4.5	10.5	5.6	4.7	7.0	10.5	12.4	44.8	100
Bact.	36.1	26.5	13.8	7.6	-	4.4	6.1	5.5	100
Pathology	47.4	26.1	-	-	-	18.2	8.3	-	100
Clinical Chemistry	48.9	36.2	-	-	-	7.1	7.8	-	100
Clinical Pathology	52.7	34.3	5.4	-	-	-	7.6	-	100
	28.6	22.2	5.8	3.5	2.8	8.4	9.3	19.4	100
			31.5						
Public Health	6.3	65.8	10.5	-	-	6.3	11.1	-	100
			76.3						
Industrial Health	45.6	24.8	-	-	-	17.2	-	12.4	100
Preventive Medicine	48.7	-	-	2.2	-	11.7	11.2	26.2	100
Pharmacology & Materia-Medica	15.1	25.9	3.8	5.0	3.8	6.5	1.9	38.0	100
			34.7						
	25.5%	28.4%	5.3%	3.0%	2.4%	8.6%	7.8%	19.0%	100%
			36.7%						

Source: Appendix 8.

APPENDIX 14 WELSH NATIONAL SCHOOL OF MEDICINE

CATEGORY / APPORTIONMENT	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
c. CLINICAL DEPARTMENTS									
Medicine	16.7	33.2	20.0	64.6	17.6	20.4	-	21.0	25.1%
Mental Health	9.2	6.0	-	-	-	6.4	-	6.9	6.5%
Surgery	9.1	15.5	20.0	11.8	22.4	20.4	-	21.0	18.1%
Obstetrics & Gynaecology	18.4	17.9	20.0	11.8	22.4	20.4	-	27.8	19.7%
Paediatrics	16.1	13.1	40.0	-	10.7	12.0	-	15.1	14.2%
Anaesthetics	16.1	9.5	-	11.8	26.9	20.4	-	8.2	13.2%
Radiotherapy	4.4	4.8	-	-	-	-	-	-	3.2%
	100	100	100	100	100	100	100	100	100.0%
d. PARACLINICAL DEPARTMENTS									
Pathology									
Main Dept.	4.1	8.7	23.2	36.4	71.4	28.8	34.5	51.5	22.9%
Sub. Depts -									
Pathology	13.7	6.8	-	-	-	15.8	7.3	-	7.3%
Bacteriology	16.7	11.3	29.0	29.4	-	6.2	8.6	3.2	11.6%
Clinical Chemistry	14.0	9.4	-	-	-	6.2	6.8	-	7.2%
Clinical Pathology	15.4	9.1	7.2	-	-	-	6.8	-	7.4%
	(63.9)	(45.3)	(59.4)	(65.8)	(71.4)	(57.0)	(64.0)	(54.7)	(56.4%)
Public Health	3.8	36.2	29.0	-	-	11.5	20.4	-	15.2%
Industrial Health	5.8	2.9	-	-	-	6.6	-	2.0	3.2%
Preventive Medicine	16.5	-	-	6.4	-	12.0	-	11.3	8.5%
Pharmacology & Materia-Medica	10.0	15.6	11.6	27.8	28.6	12.9	3.9	32.0	16.7%
	100	100	100	100	100	100	100	100	100.0%

Source: Appendix 8

DEPARTMENTAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. CLINICAL DEPARTMENTS									
Medicine	28.0	46.4	3.8	7.1	3.8	2.0	4.8	4.1	100
			57.3						
Surgery	29.0	46.0	0.7	1.9	1.2	1.5	17.2	2.5	100
			48.6						
Therapeutics	17.8	53.4	1.7	6.8	2.5	2.5	10.0	5.3	100
			61.9						
Psychiatry	57.2	42.8	-	-	-	-	-	-	100
	28.1%	47.3%	1.9%	4.4%	2.2%	1.8%	10.9%	3.4%	100%
			53.6%						
b. PARACLINICAL DEPARTMENTS									
Pathology	17.4	30.2	11.0	3.1	-	8.8	5.9	23.6	100
			44.3						
Bacteriology	9.2	41.9	15.0	5.3	-	5.3	1.1	22.2	100
			62.2						
Chemical Pathology	14.4	23.9	11.5	28.8	-	16.1	19.7	20.8	100
			64.2						
Preventive Med. & Public Health	60.4	13.2	-	-	-	-	-	26.4	100
Radiation Med. & Medical Physics	15.0	40.0	-	3.0	15.0	7.0	9.0	11.0	100
			43.0						
Radiology	32.1	30.9	-	-	-	-	37.0	-	100
	17.8%	34.8%	9.2%	3.8%	0.8%	6.3%	5.4%	21.9%	100%
			47.8%						
CATEGORY APPORTIONMENT									
c. CLINICAL DEPARTMENTS									
Medicine	30.7	30.2	63.6	50.0	53.8	35.7	13.5	37.0	30.8%
Surgery	44.7	42.2	18.2	19.2	23.1	35.7	68.3	32.1	43.4%
Therapeutics	12.6	22.3	18.2	30.8	23.1	28.6	18.2	30.9	19.9%
Psychiatry	12.0	5.3	-	-	-	-	-	-	5.9%
	100	100	100	100	100	100	100	100	100.0%
d. PARACLINICAL DEPARTMENTS									
Pathology	41.2	36.6	50.2	34.6	-	58.5	46.8	45.6	42.2%
Bacteriology	12.1	28.4	38.3	32.4	-	19.5	4.9	23.8	23.5%
Chemical Path.	14.4	23.9	11.5	28.8	-	16.1	19.7	20.8	19.5%
Preventive Med. & Pub. Health	22.7	2.5	-	-	-	-	-	8.0	6.7%
Radiation Med. & Med. Physics	4.5	6.1	-	4.2	100	5.9	8.9	2.6	5.3%
Radiology	5.1	2.5	-	-	-	-	19.7	-	2.8%
	100	100	100	100	100	100	100	100	100.0%

Source: Appendix 9

APPENDIX 16 UNIVERSITY OF ST.ANDREWS MEDICAL SCHOOL, NINEWELLS, DUNDEE

DEPARTMENTAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. CLINICAL DEPARTMENTS									
Medicine	21.4	51.0	-	12.3	3.0	7.7	-	4.6	100
			63.3						
Therapeutics	5.8	57.6	5.0	11.0	5.5	10.1	-	5.0	100
			73.6						
Psychiatry	25.3	53.4	-	2.3	-	12.7	-	6.3	100
			55.7						
Surgery	21.3	43.5	7.7	8.7	5.1	8.6	-	5.1	100
			59.9						
Midwifery & Gynaecology	27.5	45.0	2.5	1.6	5.0	8.4	5.0	5.0	100
			49.1						
Paediatrics	12.2	47.0	5.6	9.7	5.6	11.5	2.8	5.6	100
			52.3						
	18.8%	49.5%	3.5%	7.9%	4.1%	9.7%	1.3%	5.2%	100%
			60.9%						
b. PARACLINICAL DEPARTMENTS									
Bacteriology	5.0	49.9	9.9	4.7	-	8.3	5.4	16.8	100
			64.5						
Pathology	5.2	55.2	-	2.5	-	9.3	1.2	26.6	100
			57.7						
Pharmacology	5.5	47.3	-	4.3	2.5	4.3	5.1	31.0	100
			51.6						
Clinical Chemistry	8.8	49.7	1.7	12.8	1.7	4.3	-	21.0	100
			64.2						
Public Health & Social Med.	60.2	19.0	-	-	-	5.9	-	14.9	100
Forensic Medicine	28.3	17.3	-	-	-	9.8	-	34.6	100
	11.1%	47.7%	2.4%	5.8%	0.9%	6.6%	2.3%	23.2%	100%
			55.9%						

Source: Appendix 10

APPENDIX 16   UNIVERSITY OF ST.ANDREWS MEDICAL SCHOOL, NINEWELLS, DUN

CATEGORY APPORTIONMENT	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
c. CLINICAL DEPARTMENTS									
Medicine	21.5	19.5	-	29.8	14.0	15.1	-	16.67	19.0%
Therapeutics	5.3	20.2	25.0	24.3	23.0	18.2	-	16.67	17.4%
Psychiatry	18.6	14.9	-	4.0	-	18.2	-	16.67	13.8%
Surgery	19.2	14.9	37.5	19.0	21.0	15.1	-	16.67	17.0%
Midwifery & Gynaecology	25.4	15.8	12.5	3.7	21.0	15.1	-	16.67	17.4%
Paediatrics	10.0	14.7	25.0	19.2	21.0	18.3	-	16.67	15.4%
	100	100	100	100	100	100	-	100	100.0%

CATEGORY APPORTIONMENT	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
d. PARACLINICAL DEPARTMENTS									
Bacteriology	9.0	21.4	81.2	16.2	-	25.4	47.0	14.6	20.2%
Pathology	11.8	28.9	-	10.7	-	35.2	13.2	28.6	25.0%
Pharmacology	9.0	18.1	-	13.7	50.0	11.8	39.8	24.4	18.2%
Clinical Chemistry	21.3	28.1	18.8	59.4	50.0	17.7	-	24.4	26.9%
Public Health & Social Med.	41.9	3.1	-	-	-	7.0	-	5.0	7.7%
Forensic Medicine	7.0	0.7	-	-	-	2.9	-	3.0	2.0%
	100	100	100	100	100	100	100	100	100.0%

Source: Appendix 10

APPENDIX 17 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE

DEPARTMENTAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. CLINICAL DEPARTMENTS									
Medicine	29.2	41.7	1.7	5.1	4.0	5.7	6.9	5.7	100
			48.5						
Dermatology	26.5	39.8	3.1	-	6.1	6.1	10.2	8.2	100
			42.9						
Psychological Medicine	33.9	36.6	-	4.6	3.5	4.8	8.3	8.3	100
			41.2						
Surgery	26.7	41.6	-	10.6	4.4	4.4	6.7	5.6	100
			52.2						
Anaesthetics	24.0	38.6	-	4.0	6.7	8.0	8.0	10.7	100
			42.6						
Midwifery & Gynaecology	22.1	45.0	-	1.8	-	10.1	11.9	9.1	100
			46.8						
Paediatrics	28.3	32.7	3.2	4.8	-	11.1	8.8	11.1	100
			40.7						
Speech Pathology	34.0	17.1	-	-	-	8.5	6.4	34.0	100
	28.1%	38.4%	1.0%	4.8%	3.3%	6.9%	8.3%	9.2%	100%
			44.2						
b. PARACLINICAL DEPARTMENTS									
Bacteriology	10.8	26.3	7.5	7.4	1.9	5.3	6.7	34.1	100
			41.2						
Industrial Health	33.0	43.1	1.8	3.1	-	7.9	6.2	4.9	100
			48.0						
Public Health	42.8	12.7	-	-	-	6.4	22.2	15.9	100
Medical Physics	14.6	35.7	-	3.3	18.2	12.0	8.4	7.8	100
			39.0						
Demyelinating Disease Research	7.4	54.7	-	23.7	-	2.3	11.9	-	100
			78.4						
Clinical Chemistry	8.3	49.6	1.8	12.1	2.3	6.9	9.3	9.7	100
			63.5						
	15.2%	34.5%	4.1%	7.6%	3.5%	6.7%	8.3%	20.1%	100%
c. "PRECLINICAL" DEPARTMENTS									
Anatomy	9.8	13.3	3.7	4.4	-	2.1	2.9	63.8	100
			21.4						
Physiology	11.3	18.8	4.4	7.6	3.1	4.5	4.0	46.3	100
			30.8						
Pharmacology	20.0	33.7	-	6.3	5.0	6.3	7.5	21.2	100
			40.0						
	11.8%	18.6%	3.5%	6.1%	2.1%	3.8%	4.0%	50.1%	100%

Source: Appendix 11

APPENDIX 17 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE

CATEGORY APPORTIONMENT	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
d. CLINICAL DEPARTMENTS									
Medicine	19.1	19.9	30.0	19.7	22.6	15.2	15.2	11.4	18.3%
Dermatology	9.7	10.6	30.0	-	19.3	9.1	12.6	9.1	10.4%
Psychological Medicine	18.3	14.4	-	14.5	16.1	10.6	15.2	13.6	15.2%
Surgery	17.9	20.4	-	41.6	25.8	12.1	15.2	11.4	18.8%
Anaesthetics	6.7	7.9	-	6.6	16.1	9.1	7.6	9.1	7.9%
Midwifery & Gynaecology	9.0	13.4	-	4.4	-	16.7	16.5	11.4	11.4%
Paediatrics	13.3	11.2	40.0	13.2	-	21.2	13.9	15.9	13.1%
Speech Pathology	6.0	2.2	-	-	-	6.0	3.8	18.1	4.9%
	100	100	100	100	100	100	100	100	100.0%
e. PARACLINICAL DEPARTMENTS									
Bacteriology	33.3	35.6	86.4	45.3	25.0	37.4	37.5	79.6	46.8%
Industrial Health	28.3	16.3	5.8	5.2	-	15.6	9.6	3.2	13.0%
Public Health	14.3	1.8	-	-	-	4.9	13.5	4.0	5.1%
Medical Physics	11.9	12.8	-	5.2	63.7	22.1	12.5	4.8	12.4%
Demyelinating Disease Research	2.7	8.6	-	16.9	-	1.8	7.7	-	5.4%
Clinical Chemistry	9.5	24.9	7.8	27.4	11.3	18.2	19.2	8.4	17.3%
	100	100	100	100	100	100	100	100	100.0%
f. "PRECLINICAL" DEPARTMENTS									
Anatomy	34.1	28.6	43.9	29.6	-	22.9	29.8	53.4	41.3%
Physiology	42.7	43.7	56.1	56.4	66.7	54.2	44.7	42.1	44.9%
Pharmacology	23.2	27.7	-	14.0	33.3	22.9	25.5	4.5	13.8%
	100	100	100	100	100	100	100	100	100.0%

Source: Appendix 11

APPENDIX 18 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

DEPARTMENTAL STRUCTURE	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
a. CLINICAL DEPARTMENTS (school types 1 & 2)									
Medicine	33.2	53.5	1.9	4.6	-	1.9	-	4.9	100
			60.0						
Surgery	30.6	53.1	2.5	1.8	-	2.5	-	9.5	100
			57.4						
Paediatrics	30.3	49.5	3.4	4.9	-	3.4	-	8.5	100
			57.8						
Obstetrics & Gynaecology	23.5	46.3	6.8	4.9	-	10.0	-	8.5	100
			58.0						
Psychiatry	35.2	53.0	2.1	-	-	4.3	-	5.4	100
			55.1						
Radiology	23.5	49.5	6.8	4.9	-	6.8	-	8.5	100
			61.2						
Preventive Medicine	23.5	49.5	6.8	4.9	-	6.8	-	8.5	100
			61.2						
Shared Clinical Facilities							30.3	69.7	100
	27.9%	47.8%	3.2%	3.2%	-	3.7%	2.3%	11.9%	100%
			54.2%						
b. BASIC SCIENCE DEPARTMENTS (school type 1)									
Anatomy	6.3	23.7	1.3	1.9	-	8.1	0.9	57.8	100
			26.9						
Biochemistry	9.9	29.0	2.1	6.8	2.1	2.1	-	48.0	100
			37.9						
Physiology	9.4	25.0	2.1	7.2	2.1	9.3	-	44.9	100
			34.3						
Microbiology	7.3	32.2	11.2	1.5	-	7.3	-	40.5	100
			44.9						
Pathology	9.3	29.0	11.3	5.0	-	4.2	1.9	14.6	100
			45.3						
Pharmacology	9.9	24.3	6.7	2.5	-	6.4	-	50.2	100
			33.5						
	8.5%	27.0%	5.5%	3.9%	0.6%	6.4%	0.5%	47.6%	100%
			36.4%						

Source: Appendix 12

APPENDIX 18 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

DEPARTMENTAL STRUCTURE (contd.)	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
c. BASIC SCIENCE DEPARTMENTS (school type 2 - with multidiscipline teaching laboratories)									
Anatomy	7.6	28.8	1.5	2.3	-	9.9	1.1	48.8	100
			32.6						
Biochemistry	14.2	41.9	3.1	9.9	3.1	3.1	-	24.7	100
			54.9						
Physiology	13.6	36.1	3.1	10.4	3.0	13.5	-	20.3	100
			49.6						
Microbiology	10.6	46.4	16.2	2.2	-	10.6	-	14.0	100
			64.8						
Pathology	12.3	38.7	15.2	6.6	-	5.5	2.5	11.2	100
			60.5						
Pharmacology	15.0	36.5	10.0	3.7	-	9.6	-	25.2	100
			50.2						
	11.6%	36.9%	7.6%	5.4%	0.8%	8.7%	0.7%	28.3%	100%
			49.9%						

Source: Appendix 12

APPENDIX 18 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

CATEGORY APPORTIONMENT	Offices	Labs.	Suppl. lab. accom.	Anc. labs.	Wkshps	Stores	Miscl.	Teach.	
d. CLINICAL DEPARTMENTS (school types 1 & 2)									
Medicine	32.8	30.8	16.68	40.0	-	14.38	-	11.1	27.5%
Surgery	23.2	23.5	16.68	12.0	-	14.38	-	16.8	21.2%
Paediatrics	8.6	8.1	8.3	12.0	-	7.1	-	5.6	7.8%
Obstetrics & Gynaecology	6.6	7.6	16.68	12.0	-	21.0	-	5.6	7.8%
Psychiatry	15.6	13.8	8.3	-	-	14.38	-	5.6	12.5%
Radiology	6.6	8.1	16.68	12.0	-	14.38	-	5.6	7.8%
Preventive Medicine	6.6	8.1	16.68	12.0	-	14.38	-	5.6	7.8%
Shared Clinical Facilities							100.0	44.1	7.6%
	100	100	100	100	100	100	100	100	100.0%
e. BASIC SCIENCE DEPARTMENTS (school type 1)									
Anatomy	18.1	21.2	5.5	11.4	-	31.0	39.2	29.4	24.2%
Biochemistry	17.0	15.7	5.5	25.3	50.0	4.9	-	14.7	14.6%
Physiology	16.2	13.5	5.5	26.4	50.0	21.5	-	13.8	14.6%
Microbiology	12.6	17.4	29.6	5.5	-	16.8	-	12.5	14.6%
Pathology	19.9	19.7	37.2	22.8	-	11.9	60.8	15.0	18.2%
Pharmacology	16.2	12.4	16.7	8.6	-	13.9	-	14.6	13.8%
	100	100	100	100	100	100	100	100	100.0%
f. BASIC SCIENCE DEPARTMENTS (school type 2)									
Anatomy	18.1	21.2	5.5	11.4	-	31.0	39.2	47.2	27.3%
Biochemistry	17.0	15.7	5.5	25.3	50.0	4.9	-	12.1	13.8%
Physiology	16.2	13.5	5.5	26.4	50.0	21.5	-	9.9	13.8%
Microbiology	12.6	17.4	29.6	5.5	-	16.8	-	6.9	13.8%
Pathology	19.9	19.7	37.2	22.8	-	11.9	60.8	12.7	18.7%
Pharmacology	16.2	12.4	16.7	8.6	-	13.9	-	11.2	12.6%
	100	100	100	100	100	100	100	100	100.0%

Source: Appendix 12

APPENDIX 19 ROYAL INFIRMARY, EDINBURGH
teaching areas

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. thrs.	Lect. thr. suppl.	Stores	Miscl.	
a. CLINICAL DEPARTMENTS									
Dermatology	300								300
Medicine	600								600
Psych. Med.	300							80	380
Resp. Diseases	500								500
Anaesthetics	640		200						
Orthopaedics	750							150	900
Surgery (clin.)	600								600
	3690		200					230	4120
b. PARACLINICAL DEPARTMENTS									
Bacteriology		1600	5000 1000	250	650			500	9000
Clinical Chemistry		600	2400 900	300			300		4500
Med. Physics	600		1200 600		450			300	3150
Pathology		1800	3000	300					5100
Radiodiagnosis	800		1500					250 545	3595
Public Health & Social Medicine		1600	900						2500
	1400	5600	16500	850	1100	500	300	1595	27845
c. CENTRAL									
Demonstration Area			5000	500			200 500	150	6350
Lecture Theatres					5190	100 400 200			
					2690	100 300			
					2190	100 300			
					2190	100 400			
					1190	100 400			
					1580	400			
					15030	2900			17930
Seminars & Tutorials	1200(2 @ 600) 2400(6 @ 400)	1000(5 @ 200)							4600
Student Clinical Laboratory			6000	2100					8100
	3600	1000	1100	2600	15030	2900	700	150	36980

Source: Schedules of Accommodation for the University of Edinburgh Faculty of Medicine, 31st. January, 1963

All areas in sq.ft., net - circulation excluded.

APPENDIX 20 WELSH NATIONAL SCHOOL OF MEDICINE
teaching areas

	Semnrs Tuts.	Labs.	Lab. suppl.	Lect. thrs.	Lect. thr. suppl.	Stores	Miscl.
a. CLINICAL DEPARTMENTS							
Medicine	300			466(1/3 share)			766
Mental Health	250						250
Surgery	300			466(1/3 share)			766
Obstetrics & Gyn.	300	250		466(1/3 share)			1016
Paediatrics	300	250					550
Anaesthetics	300						300
	1750	500		1398			3648
b. PARACLINICAL DEPARTMENTS							
Pathology							
Main Dept.	500	4800		1000	100		
Bacteriology		400					6800
Preventive Medicine	300	650 450					1400
Pharmacology & Materia Medica	350	1000 500 2000	120				3970
	1400	9800	120	1000	100		12420
c. CENTRAL							
Lecture Hall				2500	100		2600
Library						6538	6538
Museum						2400	2400
				2500	100	8938	11538

Source: Architectural Competition, 8th April, 1959, Conditions and Instructions to Competing Architects and Schedules of Accommodation.

All areas in sq.ft., net - circulation excluded.

APPENDIX 21 UNIVERSITY OF SHEFFIELD MEDICAL SCHOOL
teaching areas

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. thrs.	Lect. thr. suppl.	Stores	Miscl.	
a. CLINICAL DEPARTMENTS									
Medicine	300								300
Surgery		260							260
Therapeutics		250							250
	300	510							810
b. PARACLINICAL DEPARTMENTS									
Pathology (general & special)									
Pathology	300								
Neuropath.	250								
Haematology	250								
	800								800
Bacteriology	250								250
Chemical Pathology	250								250
Path., Bact., Chemical Path., Pharmac. (shared)	250 250 250 250		2500) 2500)	250	990 990		250	400 900	
	1000		5000	250	1980		250	1300	9780
Preventive Med. & Pub. Health	500		400				100		1000
Radiation Med. & Medical Physics			330						330
	2800		5730	250	1980		350	1300	12410
c. CENTRAL									
Lecture Theatres					3190) 2190) 1000	150			
					6380	150			6530
Library								7000	7000
Museum								2200	2200
					6380	150		9200	15730

Source: Schedules of Accommodation for New Teaching Hospital and Clinical Medical School, Glossop Road, Sheffield 10. Revised Edition, September 1961.

All areas in sq.ft., net - circulation excluded

APPENDIX 22 UNIVERSITY OF ST.ANDREWS MEDICAL SCHOOL, NINEWELLS, DUNDEE teaching areas

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. Thrs.	Lect. Thr. Suppl.	Stores	Miscl.	
a. CLINICAL DEPARTMENTS									
Medicine	286								286
Therapeutics	286								286
Psychiatry	286								286
Surgery	286								286
Midwifery & Gynaecology	286								286
Paediatrics	286								286
	1716								1716
b. PARACLINICAL DEPARTMENTS									
Bacteriology			1500						
			600						2100
Pharmacology			1000						
			1500						
			1000						3800
Clinical Chemistry			1000						
			1500						
			1000						3500
Public Health & Social Medicine	286		430						716
Forensic Medicine		430							430
	286	430	13630						14346
c. CENTRAL									
Lecture Theatres					3500	100	200		
						400			
					1200	100			
						400			
					1200	100			
						400			
					5900	1500	200		7600
Museum								2500	2500
Library								13500+	13500
					5900	1500	200	16000	30000

Source: Schedules of Accommodation, Second Edition, April 1961.

All areas in sq.ft., net - circulation excluded.

+ This does not take account of a 2 storey book stack area of approx. 2100 sq.ft.

Scheduled teaching lab. areas include suppl. lab. accom. but schedules do not define these areas.

APPENDIX 23 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE
teaching areas

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. Thrs.	Lect. Thr. suppl.	Stores	Miscl.	
a. CLINICAL DEPARTMENTS									
Medicine	500								500
Psych. Med.	400								
	200								600
Dermatology	400								400
Surgery	500								500
Anaesthetics	400								400
Midwifery & Gynaecology	500								500
Paediatrics	500		200						700
Speech Pathology	400							400	800
	3800		200					400	4400
b. PARACLINICAL DEPARTMENTS									
Bacteriology	400		4000		400			200	
			2025						
			600						
			800						
			600						
			400						
			500						
	400		8925		400			200	9925
Industrial Health	400								400
Public Health	500								500
Medical Physics			600						600
Clinical Chemistry	400		400	250					1050
	1700		9925	250	400			200	12475

Source: Schedules of Accommodation, April 1962.

All areas in sq.ft., net - circulation excluded

APPENDIX 23 UNIVERSITY MEDICAL SCHOOL OF NEWCASTLE UPON TYNE
teaching areas

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. Thrs.	Lect. Thr. suppl.	Stores	Miscl.	
c. "PRECLINICAL" DEPARTMENTS									
Anatomy	500		2000	600			750	300	
			3750	300			300	1800	
			400				300	200	
			3200	200					
			360						
			400						
	500		10110	1100			1350	2300	15360
Physiology	600		1050	200					
			3200						
			3200						
			300						
			300						
			1350						
			600						
			600						
			320						
			400						
	600		11320	200					12120
Pharmacology	400		360						
			540						
			400						1700
	1500		22730	1300			1350	2300	29180
d. CENTRAL									
Examination Hall					3500				3500
Lecture Theatres					3700	300			
					2190	300			
					1390	400			
					1390	300			
					8670	1300			9970
Seminars	800								
	1000								
	1200								
	200(ante rm.)								3200
Library								15450	15450
Museum								2000	
								300	
								200	
								300	2800
Multidiscipline+ Laboratories			A.5500	1375)	1290				
			B.5500	1375)					
			C.5250	800					
			D.5250	800					
			21500	4350	1290				27140
	3200		2150	4350	13460	1300		18250	62060

Source: Schedules of Accommodation, April 1962. All areas in sq.ft. net.
+ Allowance - 25% prep. for A & B, 15% prep. for C & D, 50 sq.ft./ student

APPENDIX 24 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE teaching areas

	Semnrs	Tuts.	Labs.	Lab. suppl.	Lect. Thrs.	Lect. Thr. suppl.	Stores	Miscl.	
a. CLINICAL DEPARTMENTS (school types 1 & 2)									
Medicine	350								
	350								700
Surgery	350								
	350								
	350								1050
Paediatrics	350								350
Obstetrics & Gynaecology	350								350
Psychiatry	350								350
Radiology	350								350
Preventive Med.	350								350
Shared Clinical Facilities					1380				
					1380				2760
	3500				2760				6260
b. BASIC SCIENCE DEPARTMENTS (school type 1)									
Anatomy	350		3840	1140			250		
	280		720	570					
			4320	160					
			720						
			410						
	630		10010	1870			250		12760
Biochemistry	350		4320	570					
			720	205			205		
	350		5040	775					6370
Physiology	350		4320						
			720						
			570						
	350		5610						5960
Microbiology	350		4320						
			720						5390
Pathology	350		4320	570				220	
	310		720						
	660		5040	570				220	6490
Pharmacology	350		4320	330					
			820						
			490						
	350		5630	330					6310
	2690		36370	3545			455	220	43280
c. CENTRAL									
Conference Rms.	1080(3 @ 360)								1080
Lecture Rms:					2760(2 No.)				
					1020				3780
Library								23350	23350
Study Cubicles								9400 (200 No.)	9400
	1080				3780			32750	37610

Source: U.S. Dept. of H.E.W. - "Medical School Facilities" - areas in sq.ft.

APPENDIX 24 U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
teaching areas

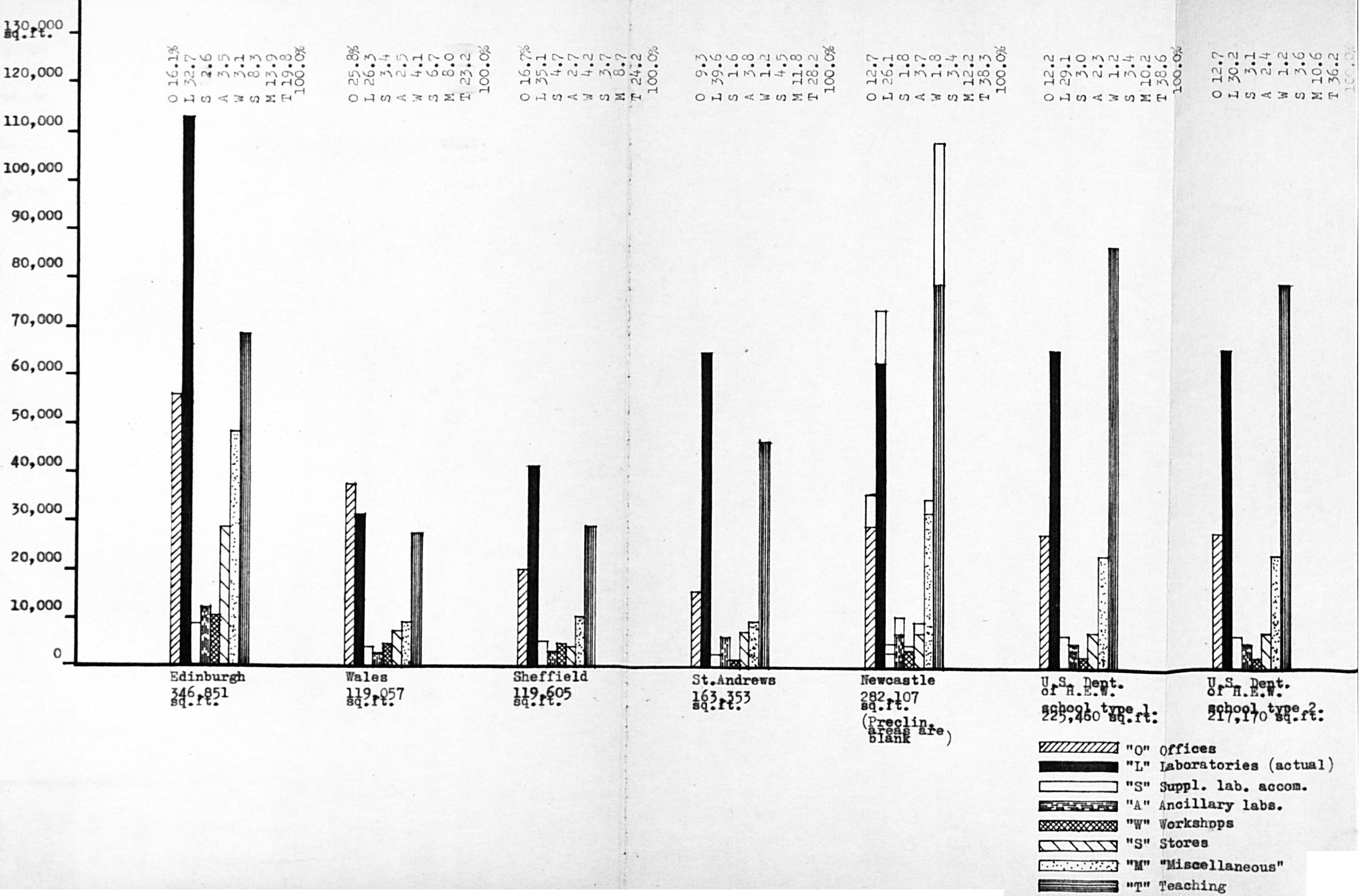
d. BASIC SCIENCE DEPARTMENTS (school type 2)	SemnrsTuts.	Labs.	Lab. suppl.	Lect. Thrs.	Lect. Thr. suppl.	Stores	Miscl.	
Anatomy	350	3840	1140			250		
	280	940	570					
		940	160					
		410						
	630	6130	1870			250		8880
Biochemistry	350	940	570					
			205			205		
	350	940	775			205		2270
Physiology	350	940						
		570						1860
Microbiology	350	940						1290
Pathology	350	940	570				220	
	310							2390
Pharmacology	350	940	330					
		490						2110
	2690	11890	3545			455	220	18800

e. CENTRAL (school type 2)	SemnrsTuts.	Labs.	Lab. suppl.	Lect. Thrs.	Lect. Thr. suppl.	Stores	Miscl.	
Conference Rms.	360							
	360							
	360							1080
Lecture Rms.				1380				
				1380				
				1020				3780
Library							23350	23350
Study Cubicles							9400 (288 No.)	9400
Multidiscipline Laboratories		11280	2400			860	630	
			380			80		
			360			200		
		11280	3140			1140	630	16190
	1080	11280	3140	3780		1140	33380	53800

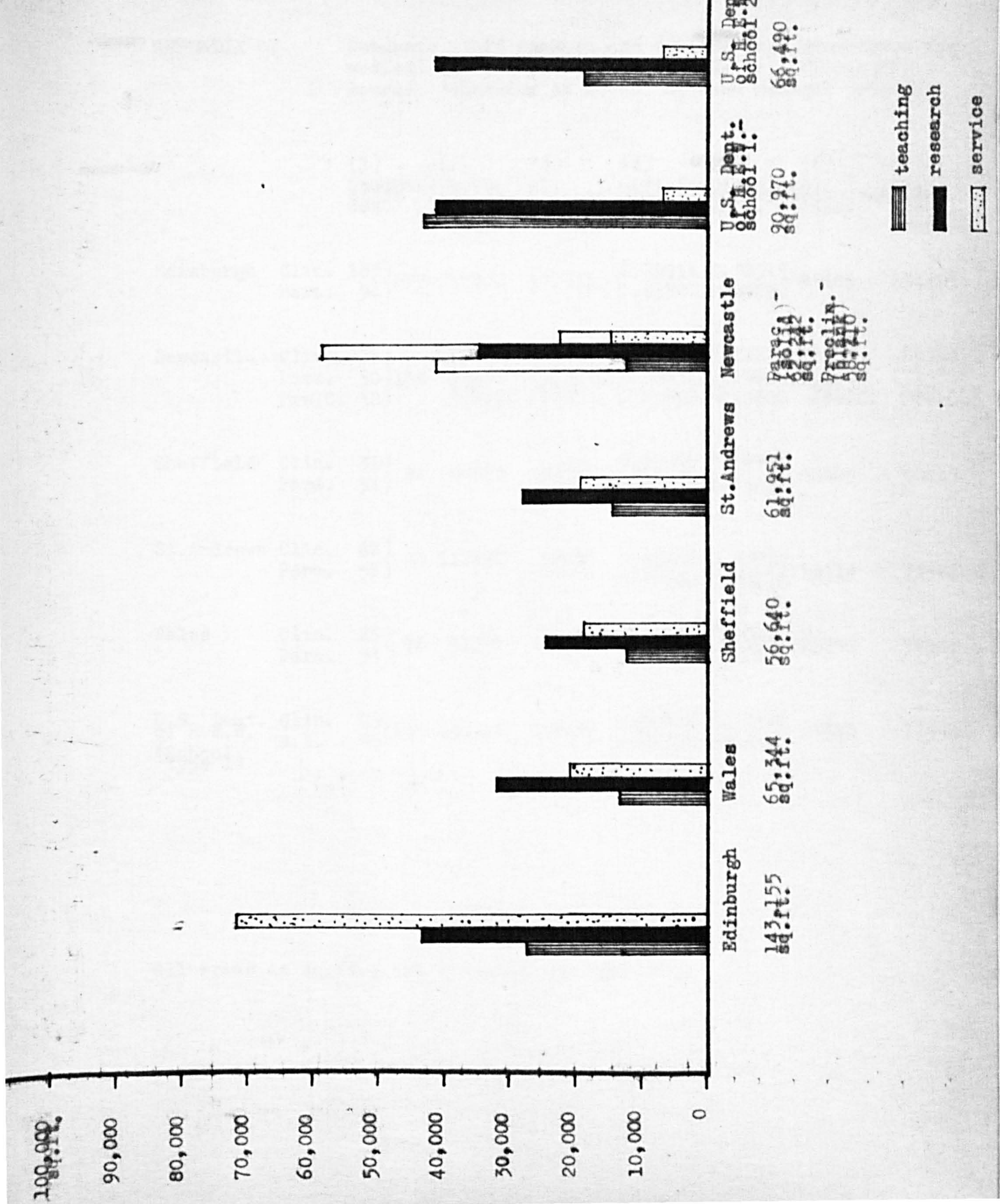
Source: U.S. Department of Health, Education, and Welfare - "Medical School Facilities, planning considerations and architectural guide". Publication No. 875, 1961.

All areas in sq.ft., net - circulation excluded.

APPENDIX 25 (Fig. 39): Structures (by Category) of medical schools examined in Chapter 3.



APPENDIX 26 (Fig. 40): Apportionment of basic functions in Paraclinical (or Basic Science) Depts. of medical schools examined in Chapter 3.



APPENDIX 27 Academic staff numbers and various area breakdowns for medical schools considered in Chapter 3 (Table 23)
Source: Schedules of accom. of each medical school.

		(1) Academic staff nos.		(2) Whole school area - exc "Teach."	(3) All research area	(4) Division research areas	(5) Division research labs.	(6) All research labs.	(7) All lab. accom. - inc. service
Edinburgh	Clin. Para.	183 94	277	277906	171691	C.99411 P.43320	C.38515 P.29210	96685	134455
Newcastle	Clin. Para. Pre.C.	66 50 38	154	173992 (144962 exc Pre.C.)	124846 (101296 exc Pre.C.)	C.43305 P.34971 PC23550	C.21130 P.19455 PC14600	78205 (63605 exc Pre.C.)	89330 (72930 exc Pre.C.)
Sheffield	Clin. Para.	31 51	82	90655	59320	C.22960 P.25360	C.12750 P.15055	38805	50815
St.Andrews	Clin. Para.	42 51	93	117291	78280	C.31200 P.28200	C.20024 P.20410	59314	73522
Wales	Clin. Para.	26 53	79	91451	58225	C.21811 P.32014	C.10012 P.10880	25292	38367
U.S. Dept. of H.E.W. (School type 1)	Clin. B.S.	85 50	135	138310	103290	C.46280 BS41090	C.28480 BS28950	73350	77550

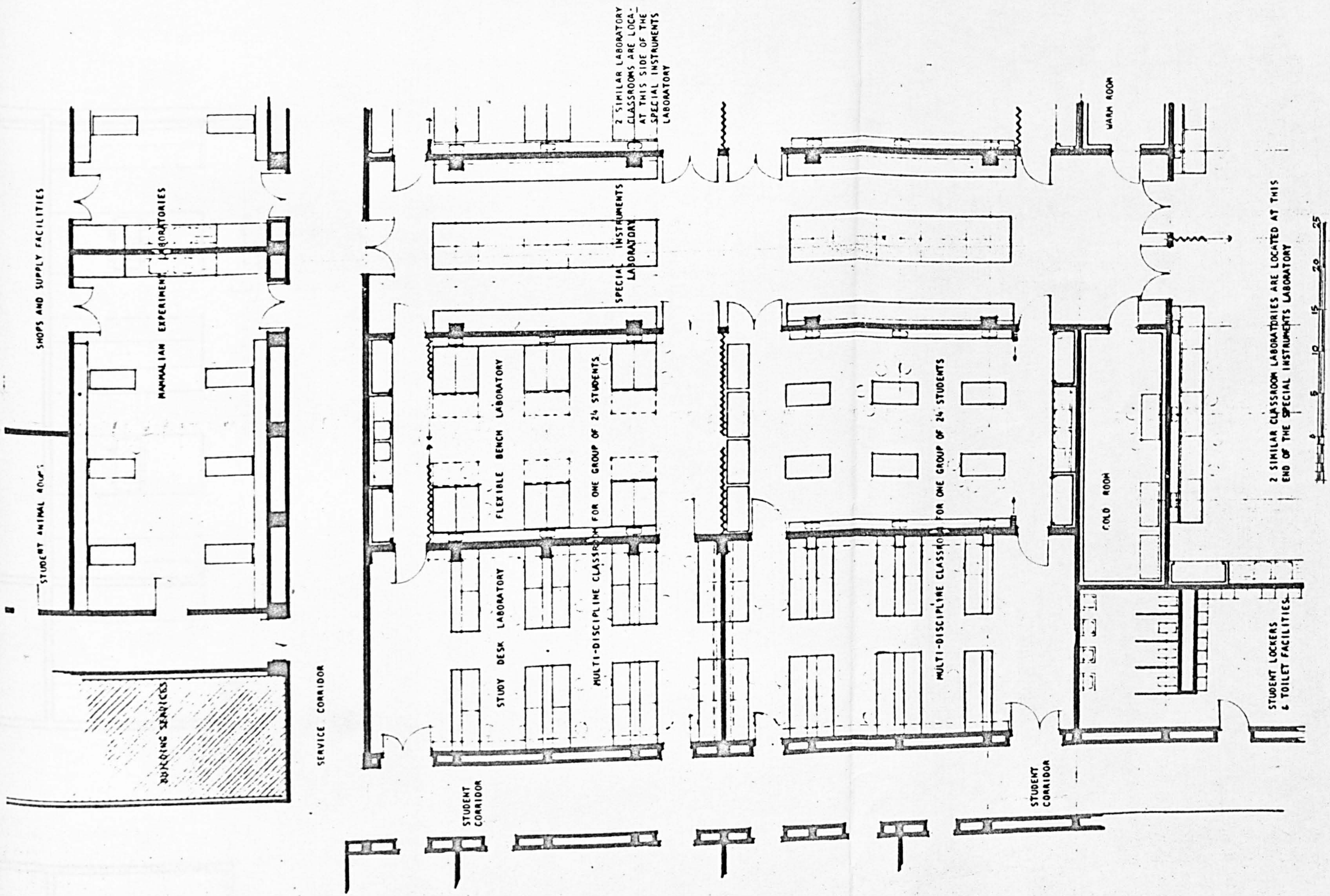
All areas in sq.ft., net - circulation excluded

APPENDIX 28 Student numbers, teaching areas, and teaching hospital bed complements for medical schools considered in Chapter 3 (Table 25)
Source: Schedules of accom. of each medical school.

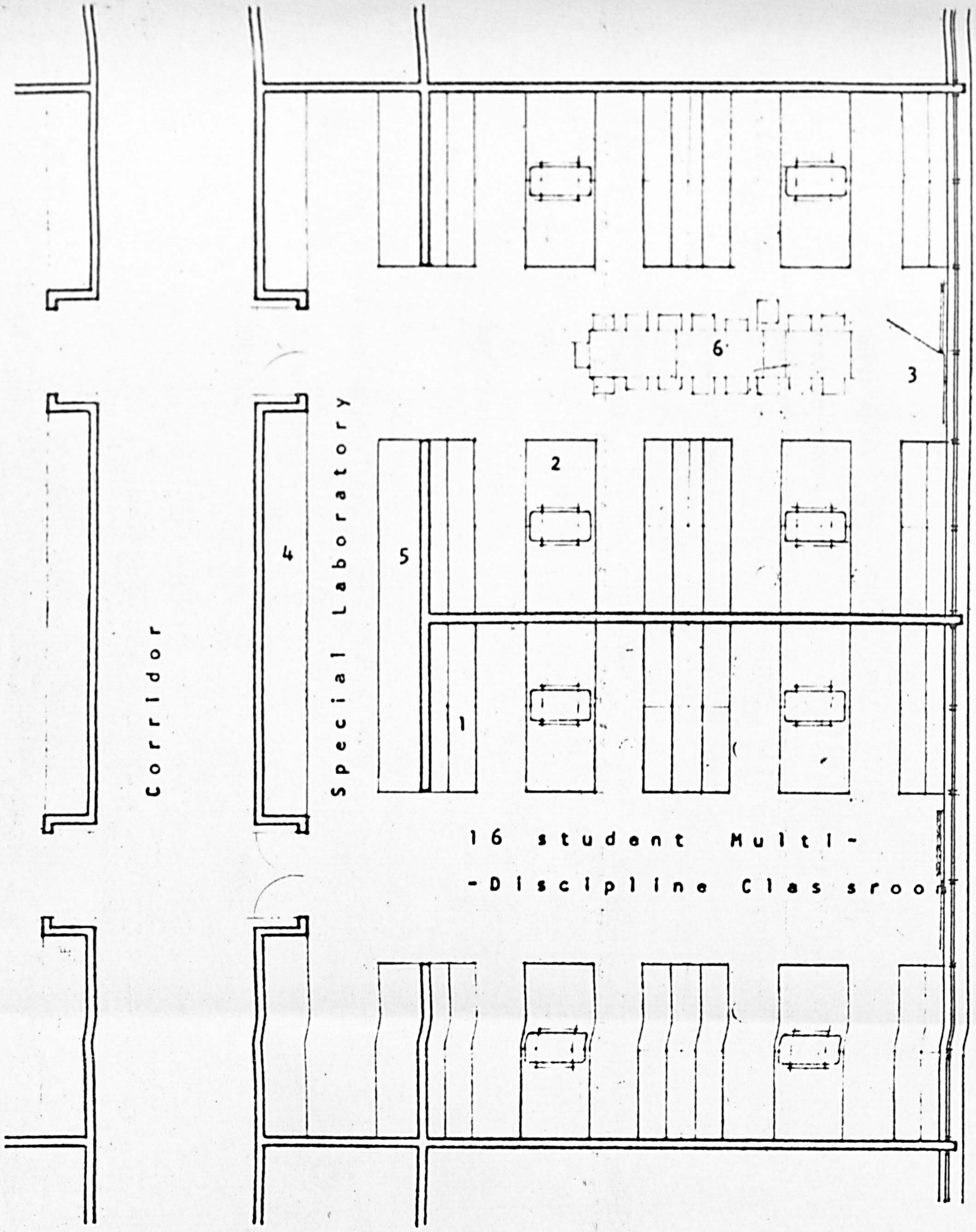
	All students	Medical Students				Total teaching area	Teaching hosp. beds
		"Clin." under-grad.	All under-grad.	Post-grad.	All medical students		
Edinburgh		450	450	200	650	68945 sq.ft.	850
Newcastle	950	300 c.	550	100	650	108115 sq.ft.	1060
Sheffield	450	240	240	110 c.	350	28950 sq.ft.	703
St.Andrews	477	260	260	75	335	46062 sq.ft.	709
Wales	500	230	230	95	325	27606 sq.ft.	650
U.S. Dept. of H.E.W. (School type 1)		180	372	95	467	87150 + (sch. 1) 78860 + (sch. 2)	700

\+ Without Study cubicles, areas are - School 1, 77750 sq.ft.
School 2, 69460 sq.ft.

APPENDIX 29. HARVARD MEDICAL SCHOOL: Medical student "home", combining separate "dry" study and "wet" laboratory functions, (Fig. 41)



APPENDIX 30. UNIVERSITY OF SOUTHERN CALIFORNIA: Multidiscipline teaching labs. (Fig. 42)



1 Study Desk
2 Chem-Physiology Desk
3 Chalkboard
4 Floor Standing Equipment
5 Instrument-Prep. Desk
6 Conference Table

0' 5' 10' 15' 20' 25'

scale in feet

2,760 sq ft / 32 = <u>86 sq ft/student</u>

APPENDIX 31. Comparative student ratios in multidiscipline teaching laboratories at the following medical schools - Harvard, Southern California, Stanford, & Western Reserve. (Table 29)

Harvard	98 sq.ft./ student (this includes separate areas for "wet" & "dry" activities)
University of Southern California	86 sq.ft./ student
Western Reserve	58 sq.ft./ student
Stanford	97 sq.ft./ student

These allowances are inclusive of supplementary accom. It is understood that Western Reserve has decided that its areas are inadequate and that new laboratories based on a ratio of 90 sq.ft./ student are now being planned.

The following are the area allowances for these same schools in consideration of laboratory areas only.

Harvard -	24 students/lab.	40 sq.ft./ student (this is for the lab. only - there is also a separate study desk area of the same size)
University of Southern California	16 students/unit	56 sq.ft./ student
Western Reserve	16 students/unit	44 sq.ft./ student
Stanford	16 students/unit	50 sq.ft./ student